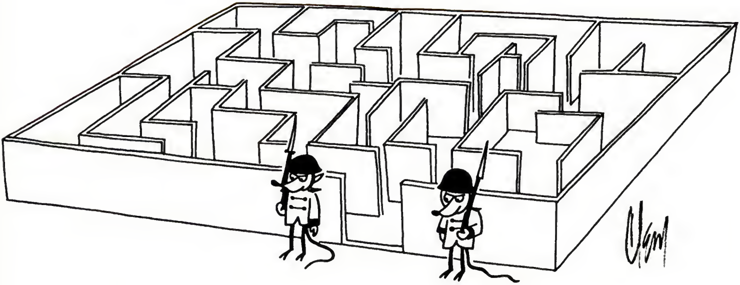
THE BULLETIN
OF THE ATOMIC SCIENTISTS

1981 Rabinowitch Prize Essays
Necessary negotiations
The last Europe



The case of the stranded sub

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March 1982 $2.50
VOLUME 38 NUMBER 3

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In this issue of The Bulletin

March 1982 Vol. 38, No. 3

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Editorial and advertising correspondence should be sent to 1020-24 E. 58th Street, Chicago, IL 60637. Manuscripts must be submitted in duplicate and accompanied by a stamped self-addressed envelope.
Subscription correspondence should be sent to the Circulation Department at the above address. Please allow 6 weeks for change of address; include your old address and new address and, if possible, an address label from a recent issue.
The Bulletin of the Atomic Scientists is published monthly ten times a year. Second class postage paid at Chicago, Illinois, and at additional mailing offices.
Subscription rates: Individuals—U.S. 1 year, $19.50; 2 years, $36; 3 years, $48. Canada and Mexico add $6.60; other countries add $9.00 per year.
Institutional—U.S. 1 year, $25; 2 years, $47; 3 years, $67. Canada and Mexico add $6.60; other countries add $9.00 per year.
Single copies—cover price plus postage. **Airmail rates**—available on request.
Claims policy: Claims for missing issues lost in transit must be dated within 90 days (domestic) and 9 months (foreign) of issue requested.

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(312) 363-5225. ISSN No. 0096–3402

This One
LL6D-8P2-AC6A

We live in an Age of Peril

"Where peril abides,
Thereto a deliverer rides."

These lines, as profound as any written by the German poet, Holderlin, may be taken by us today to mean that man-made peril bears within itself the seeds of human deliverance.

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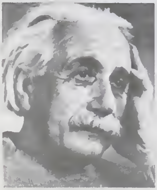

"I thank you for your interest in our common problem—the search for those truths which serve all mankind."

Faithfully yours,

Albert Einstein

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BERNARD T. FELD

Europe as 'honest broker'

There is little indication that the atmosphere of confrontation that currently pervades the international scene is likely to be dissipated in the near future. The Soviet military remains bogged down in Afghanistan, apparently not yet ready or able to proclaim victory and withdraw. The Polish hopes for discreet experimentation with humanistic communism have been smothered by a nervous military regime under the steely scrutiny of its more orthodox Warsaw Pact allies. Leonid Brezhnev continues to propose detente and accommodation, while the Soviet SS-20 missiles are deployed on schedule and their armed forces, tanks and aircraft accumulate west of the Urals.

On the Western side, European popular reluctance to be drawn directly into the futile competition encourages governmental misgivings about introducing new U.S. war fighting systems, such as cruise missiles and neutron bombs, and the doctrines of "limited or winnable" nuclear war that go with them. At the same time, popular movements for European nuclear disarmament threaten to force West European governments to accept the concept of a denuclearized Europe, without requiring any *quid pro quo* from the Eastern side.

In the circumstances, the arrogant attitude of the Reagan Administration toward the opinions and sensibilities of West Europeans is guaranteed to accelerate the growing trends toward European neutralism. Convinced that an East-West conflict would inevitably lead to the nuclear devastation of Europe, with the probable exclusion of the territories of both "superpowers" from direct involvement, the tendency is for West (and, if their views were known, probably also East) Europeans to adopt a position of "a plague on both your houses." Thus, while U.S. arm-twisting will undoubtedly bring forth ringing statements of unity and support from the rest of NATO, no sensible West European government is going to undermine the post-war European economic miracle by dumping an appreciable portion of its economic and technical resources into the bottomless rat-hole of the arms race.

One's first reaction, as an advocate of East-West detente, is to welcome the European position of honest broker between the superpowers. On the other hand, if the unsubstantiated concerns about the independence of the new European neutralists from the Soviet-controlled "peace movement" should turn out to have substance—it would be difficult for U.S. liberals to join wholeheartedly in its ranks.

But the time is more than ripe for a new and independent Western movement in opposition to the nuclear arms race and in favor of a nuclear freeze and a reduction of the unconscionably large stockpiles of nuclear weapons on both sides. This should be the overriding objective of all those convinced that the avoidance of nuclear war takes precedence over all other political concerns. Such a platform should be capable of uniting individuals and nations of different political, economic and ideological persuasions. In the end, it must prevail if the human race is to survive. ☐

CHRISTOPHER PAINE

Admiral Inman's tidal wave

In recent years Admiral Bobby Ray Inman, the former Naval Intelligence and National Security Agency (NSA) chief whom President Ronald Reagan picked as deputy CIA director, has earned a sterling reputation on Capitol Hill and elsewhere for being the archetype of what a modern intelligence officer should be.

Unlike the gung-ho covert action types and involuted, semi-paranoid counterintelligence operatives who dominated the agency until Admiral Stansfield Turner cleaned house during the Carter years, Inman is widely perceived as an official capable of maintaining a balanced view of the proper role of government secrecy and intelligence agency prerogatives in a free society. When the draconian first draft of the Reagan Administration's revised executive order on intelligence was leaked to the press in March 1981, for example, Inman hosted a rare press conference at CIA headquarters to offer public assurances that the final executive order would not give the agency power to carry out covert operations in the United States. "To the best of my knowledge," he said, "there is no intent to proceed anywhere down that line." Unfortunately, the final version of the executive order, signed by President Reagan in December 1981, does authorize domestic covert operations.

Inman's reputation for an enlightened approach was further tarnished by his performance at a recent Washington symposium, held under the auspices of the American Association for the Advancement of Science, on striking a balance between the government's need for secrecy in defense of "national security," and the scientific community's desire for openness and an unrestricted flow of information.

"Science and national security have a symbiotic relationship," Inman contended, "each benefitting from the interests, concerns, and contributions of the other. In light of the long history of that relationship, the suggestion is hollow that science might (or should somehow) be kept apart from national security concerns, or that national security concerns should not have an impact on 'scientific freedom.'"

The government's "necessity, at times, to assert the state secrets privilege" should be clear to any "fair observer," Inman argued. Since technical data "can enhance a nation's international strength," and "specific data on technical subjects is high on the wanted list of every major foreign intelligence service," Inman reasoned that in "terms of harm to the national interest, it makes little difference whether the data is copied from technical journals in a library or given away by a member of our society to an agent of a foreign power."

A special problem is posed by scientists who, unfettered by the contractual obligations entailed by government agency support, "conduct research in areas where the federal government has an obvious and preeminent role for society as a whole." One such area of longstanding concern to him was cryptography. Despite the recent "reasonable and fair" arrangement for voluntary submission of manuscripts in this area to the National Security Agency for prepublication review, Inman still professed concern that "indiscriminate publication" might cause "irreversible harm to national security interests."

Cryptography, he noted, was only one of a number of fields which should be covered by the national security review procedures developed by the American Council on Education's Public Cryptography Study Group. "Examples include computer hardware and software, other electronic gear and techniques, lasers, crop projections, and manufacturing procedures," he suggested. If these rather broad categories are merely *examples* of what might be controlled, one is tempted to wonder about the dimensions of Admiral Inman's complete list! If all areas of science and technology which are of potential interest to the Soviet military establishment are included, the list is long indeed.

Rather than risk the divisive confrontation between the government and the scientific community which is likely to result from the imposition of formal statutory controls, Inman suggested that a balance acceptable to both sides "may lie in an agreement to include in the peer review process (prior to the start of research and prior to publication) the question of potential harm to the nation." When restrictions are judged necessary, he said, "speedy procedures for appeals, review, and appropriate compensation should be included."

Inman said he had "great qualms" about turning the process over to regulatory authorities. "I don't have a great deal of confidence that they would produce the kind of byplay that we want." When asked whether the current two-year trial program for review of cryptographic research was

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likely to succeed, Inman responded, “If there is very strong peer pressure from those working in the field to review, and if NSA gives a quick response and doesn't become bureaucratic, then I think it has a very bright chance.”

Regardless of what one might think about an arrangement which establishes, even informally, the precedent of government prior restraint over private research and publication, one should not automatically question the good faith of those who seek in this method a genuine compromise between free scientific and technological development and “national security.” Indeed, there would be no reason to doubt Admiral Inman's good faith had he been content simply to outline the nature of the compromise he seeks. Regrettably, he went much further than that and attempted to browbeat the scientific community into accepting his scheme for wide-ranging informal controls by conjuring up the spectre of an outraged public demanding legislative action to stem the “hemorrhage of the country's technology” into the Soviet military machine. The scientific community's antipathy to regulation, he warned, “was about to be wiped away by a tidal wave.”

“The heart of what I've been trying to convey in this whole discussion is that I think the tides are moving, and moving pretty fast, toward legislative solutions that in fact are likely to be more restrictive than executive orders, not less, if I get correctly the mood of the country about worries on the national security side. Partly I'm influenced by knowing some things that are going to be very much in the headlines in the next six months, as the Congress turns in some of its investigations to the whole subject of technology transfer, and the depths and degree of technology transfer in facilitating the massive arms buildup of the Soviets. . . .

You can get a nice intellectual discussion of that, hopefully, in this environment, maybe a few others, but when that gets reduced to the nightly news coverage in its most captivating form, you usually get out of that a pretty widesweeping public outcry, ‘How the hell did that happen? Who's responsible? And what are you gonna do to make sure it doesn't ever happen again?’

. . . It's in that kind of mood that you overreact. And that's why it's so important for the society to follow the lead of the ACE [cryptography study group] to stimulate dialogue with the pertinent part of government now, not after that [overreaction] occurs, seeking to define the areas of technology which have a potential value to adversaries. And unless I'm far wrong, I think in the latter half of the decade, we're going to be defining that in economic competition terms, not just military.”

When queried as to where this “tidal wave” of public opinion in favor of government controls was going to come from, Admiral Inman replied, in effect, that the CIA would generate it! The government was assembling, he said, “in very highly classified surroundings,” thorough documentation

Further comment

The issue of technology transfer to the Soviet bloc is a new instance of a very old problem: how to prevent the diffusion of valuable skills across national boundaries. History teaches that the control of technology transfer is at best a rearguard action, achievable (and then only briefly) at the cost of regulations and secrecy that carry harmful side-effects of their own. This fact has not prevented every advanced nation from trying to impose controls at one time or another; in fact, since the beginnings of the industrial revolution, periods of relatively free exchange and transfer have been briefer than eras of control. But in the end the transfer of technology depends less on the fact that knowledge and skills have been divulged than on the fact that the receiver knew how to make creative use of them. From the loss of the secrets of porcelain manufacture by the Chinese to the loss of the secrets of the Sidewinder by the Americans, the ultimate consequences depend on the ability of the receiver to profit from them—and on the ability of the donor to generate more.

It follows that balancing the political costs and benefits of export controls requires weighing their claimed effects in delaying the Russians against their costs in delaying us. An export-control policy based on the assumption that the enemy needs only to be exposed to superior American knowledge and skills in order to seize upon them, master them, and turn them into major gains prejudges the most important questions and may lead us into mistakes. The aim of this report has been to take a fresh look at the effects of technology transfers by calling attention to some of the important features of the Soviet context.

Naturally, this exercise is surrounded by uncertainties. To confirm or disprove the hypotheses advanced in this report, we would need to know a great deal more than we are ever likely to know, industry by industry, about Soviet strengths and weaknesses in generating and diffusing new technology. Neither do we know enough about how technological innovation works in general. We cannot predict in detail what kinds of transfers give Soviet technologists and managers the greatest help in improving their innovative performance—or for that matter our own. The translation of new ideas into new products and processes is still a mysterious business everywhere in the world, and no one explanation accounts for more than a fraction of the cases observed. This means, let us say it frankly, that it would be unwise to attempt to base any actual export-control policy on

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Why should public outrage over technology and equipment transfers to the Soviet Union be directed at the scientific community rather than at corporations?

for the "fact" that "the bulk of new technology which they [the Soviets] have employed has been acquired either from the U.S. or its closest allies, varying from how to do accuracy on weapons systems to composite materials to lighten the load."

Fortunately, Inman's implied threat is premised on a rather significant non-sequitur: why should public outrage over technology and equipment transfers to the Soviet Union be directed at the scientific research community as a whole, rather than at the specific corporations, transactions and agreements—for the most part approved by the Nixon, Ford, and Carter Administrations—which made such transfers possible? Why would the public be willing to penalize a wide range of scientific and technical practitioners simply because the government goofed way back in 1972 when it approved, for example, the sale of 164 Bryant Centalign B grinders capable of machining precision ball bearings of the type used in Soviet ICBM inertial guidance platforms? Likewise, in what way could a backlash of prior restraints on research possibly be construed as an appropriate response to the fact that the Soviets are reportedly using engines from the Kama River truck plant—built with the assistance of IBM, Ingersoll-Rand, Rockwell International, U.S. Industries, and a host of other U.S. and European corporations—to equip military trucks and armored personnel carriers?

Inman's informal system of government censorship of privately developed scientific information can and should be evaluated on its merits, and not out of fear that it constitutes the expedient alternative to a "tidal wave" of public revulsion against scientific freedom. Public opinion will head in this direction only if it is systematically fanned and misled by hardliners in the intelligence community, the Administration, the Congress and the media, and even then, the success of such a campaign is far from assured. Apparently this Administration believes that it needs to build a dam in order to go fishing, when what is really required—or even feasible, given the nature of the international market system—is to repair its existing nets, chiefly by defining far more precisely the specific products and processes it wishes to limit.

Moreover, in a 1979 study of "Critical Technologies for Export Control," the Defense Board found that "design and manufacturing know-how are the principal elements of strategic technology control. These categories of export should receive primary emphasis:

- arrays of design and manufacturing know-how;
- keystone manufacturing, inspection and test equipment;
- products accompanied by sophisticated operation, application or maintenance know-how."

The report attempted to define major "modes,"—specific organizational or contractual frameworks—within which technology transfers occur. These were identified as "turnkey factories; licenses with technical assistance (anything beyond an arms length transaction); joint ventures; management or technical service agreements; license agreements without technical assistance (arms length transactions

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case-by-case evaluations of the Soviets' ability to absorb. The aim of this report is not to replace the critical-technologies approach with some sort of "critical-receivers" approach, for we simply do not have enough information or enough understanding to make it work.

Rather, the aim is to raise larger, cautionary questions about the broad course of export-control policy: Given the uncertainties surrounding any broadening of export controls, *in what direction is it safest to err*? The difficulties of technological innovation in the Soviet Union, and the largely negative results of recent reforms there, underscore some important points about innovation that are equally valid anywhere: First, however mysterious the details may be, it is clear that successful innovation depends on the presence of appropriate incentives and information. Potential inventors must know what opportunities exist and must stand to gain from good ideas, but also to lose from bad ones or from inaction. Potential users must know what has been invented and have both the motivation and the knowledge to choose correctly. If the Soviet system does not supply these incentives and information outside a narrow zone of closed high-priority projects, foreign imports will not fill the void.

Moreover, favorable climates for innovation, where they exist, are fragile. Regulation, however well-intentioned, introduces screens and filters between the perception of an opportunity for innovation and the inspiration and incentive to take advantage of it. Consequently, if the national purpose is to maintain the United States' technological lead, our first concern should be to remain good innovators ourselves. We should beware lest we hobble ourselves, as the Soviet system has so clearly succeeded in doing in the greatest part of its industry.

What does this imply for export-control policy? The case for export controls is strongest in areas of immediate military relevance in which the United States has a clear lead over other Western countries. As one moves outside this zone, toward technologies that afford the Soviets longer-term industrial gains and that are not areas of clear American superiority over the rest of the West, the political benefits of export controls become more diffuse and uncertain, while the costs become progressively greater. Any widening of export controls outside the first range into the second should be undertaken only with the greatest care.

—THANE GUSTAFSON

©1981, Rand Corporation, Selling the Russians the Rope *by Thane Gustafson, R-2649-ARPA, Prepared for the Defense Advanced Research Projects Agency.*

with no personnel training or support); trade shows, industrial exhibitions, symposia, and technical meetings." Nowhere in its recommendations did the Bucy committee suggest that prior government restraints on private civilian research or scientific publication might be an effective means of controlling the flow of militarily sensitive technologies to the Soviet Union. On the contrary, it warned that too broad an attempt at controls would compromise the effort to exert "more effective control of significant items."

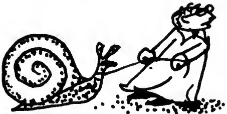
Indeed, the Administration would do well to pay heed to this admonition before lecturing the research community on the need for restraint. Perhaps Admiral Inman needs to be reminded that it was not individual researchers, but the corporate managers of such defense and intelligence community contractors as Sperry-Univac and Control Data, who pushed for less restrictive controls during the 1970s.

Even closer to home, it was not a civilian researcher, but rather a former employee of Admiral Inman's in the free-wheeling super secret Naval Intelligence Task Force 157, Edwin P. Wilson, who has since been peddling classified communications monitoring and digital image processing gear to the highest bidder, including the Soviet Union. In fact, with CIA connivance both types of classified equipment were exported to Iran during the last years of the Shah's rule for use in the agency-designed "Project Ibex," an ambitious electronic warfare and intelligence network with important internal security functions. When SAVAK's electronic intelligence headquarters at an Iranian air base in Tehran was overrun by rebel forces in the winter of 1979, the storage area for secret technical data and manuals on U.S. weaponry and equipment was captured almost intact. U.S. intelligence agencies now assume that significant data on all these systems—ranging from the sophisticated Hughes Phoenix air-to-air missile system to the Stanford Technology Corporation's 101 computer-driven satellite image interpretation system—is now in the Soviets' possession.

An effective, if somewhat conservative, riposte to Admiral Inman's views was presented to the American Association for the Advancement of Science's gathering by Peter J. Denning, head of Purdue University's Department of Computer Science and president of the Association for Computing Machinery. The imposition of statutory controls on the free flow of scientific information, Denning argued, would pose a far greater cost to our economic power "than any reduction in risk to the national security that might result from such controls."

While the Atomic Energy Acts of 1946 and 1954 provided a precedent for such controls, nuclear energy represented a special case, as it was developed by massive secret government projects encompassing virtually all the researchers in the field at that time. "The rest of science," Denning noted, "cannot be retrofitted with the born classified principle." Moreover, as evidenced by recent court cases, the nuclear energy field has now developed to the point where the "born classified" concept is probably unenforceable when applied to the restraint of privately-generated information.

How extensive a control system over privately-generated information would be required to achieve a significant reduction in the flow of technological information to potential adversaries? Denning noted that such a system would require the screening of all items submitted to conferences and journals, and the monitoring of the informal distribution of technical journals and reports. Scientists and engineers would have to obtain licenses to travel abroad to attend conferences and present papers. Non-citizens would have to be carefully screened before being allowed to visit university research laboratories and industrial facilities.



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Denning argued that these measures would have to be applied uniformly against all countries in order effectively to reduce the flow of information to the few that threaten American security.

"The required system," Denning noted, "is clearly more compatible with a dictatorship than a democracy." U.S. leadership of the world economy is largely attributable, he contended, to "the most effective system of technology transfer in the world."

Denning argued that measures sufficiently restrictive to be effective would harm relationships with allies and "drive wedges" between civilian and military research, "limiting the effectiveness of both."

And then Denning observed, "It is no accident that the computing field has been free of government regulation and has an impressive record of accomplishment. . . . If you want to win the Indy 500 race, you build the fastest car. You don't throw nails on the track."

Indeed, in view of the significant cutbacks in funding for both non-military research and development and graduate student support, one wonders why the Reagan Administration is now toying with new methods of *controlling* scientific information, when the President appears quite convinced that *producing* it is not all that important. ☐

ADAM PRZEWORSKI

Marshall Plan for Poland

The military coup d'état in Poland has shown that Communist Parties are incapable of perpetuating their rule when faced with autonomous social forces, particularly with the working class. The veil has been lifted: the Party cannot rule as a representative of the working class when workers stand united against its rule. Fearing the loss of privilege, Polish party bureaucrats sought in the army the arbiter between themselves and the people. But by recognizing the army as the decisive power in the state, the Party affirmed that it has lost the capacity to rule. The communist regime will either be transformed into nationally rooted democratic socialism or it will succumb to the power of organized force.

The coup d'état of General Jaruzelski ended the rule of the Communist Party in Poland. When he became the First Secretary on October 18, 1981, Jaruzelski replaced the local administration of party secretaries by teams of officers. The coup itself was not authorized by the Party: indeed, one member of the Political Bureau admitted to not having known about the impending announcement. The ruling Council, appointed by the Prime Minister—the General himself—according to the 1967 law, does not include any Party leaders: it is a military junta. The decree specifying restrictions under martial law banned all public gatherings (including Party meetings), with the one explicit exception of religious observances. Indeed, to find out about "the various aspects of the martial law," the Party's central newspaper, *Trybuna Ludu*, had to interview some Brigadier General on December 21. Military officers and their civilian appointees are replacing industrial managers picked by the Party. A new official newspaper was founded as an alternative to the Party organ. These are strong indications that in all spheres of control the military apparatus is replacing the Party.

In fact, I suspect that Jaruzelski's references to the Party are a bow to the Soviets. For if the Soviet Union had indeed politically orchestrated this repressive campaign, its appearance would have been different. The spectre of autonomous military rule must be frightening the Soviets. The significance of the Polish coup cannot be lost upon them, and while they certainly prefer that Solidarity be squashed, the loss of power by the Party is a violation of basic ideological and political principles.

And the army will be there for quite some time. Even if the military wanted to extricate themselves from power, a return to civilian rule would be possible only on two conditions.

- There must exist some political force or a coalition of forces to which power could be devolved—a coalition which is acceptable to the military and also capable of maintaining order and managing the economy.
- Repression cannot become so brutal as to leave a sediment of hatred in the society and make its executors fear eventual reprisals.

Whether by design or the spontaneous logic of events, both of these conditions seem to be rapidly vanishing. Returning power to the Party would immediately recreate the very conditions which made the military intervene to begin with, and the potential interlocutors for the creation of some kind of coalition are being physically removed and ideologically defined out of the political spectrum by indiscriminate repression. And this repression, although not massive by comparative standards, seems sufficiently brutal to reopen the deepest wound of social memory. Indeed, I fear a coup within the coup: an alliance of the most repressive groups within the Party with the police. A nominal rule of the Party based on secret police and committed to unlimited repression would certainly be preferable for the Soviets to the still somewhat hesitant dictatorship of the autonomous army. It is significant that while the Polish media insist that calm has been restored in the country, Soviet newspapers continue to list details of resistance and to magnify the threat posed by Solidarity.

If this analysis is correct, then the dividing lines in Poland do not run simply between "the Communists" and the people; they run also between the army and the Party and, I believe, between the Polish army and the Soviet Union. All three—the Polish army, the Party bureaucrats, and the Soviet Union—are united in their desire to arrest the development of democracy and workers' rights in Poland, and all three are responsible for the repression. But their motivations and their projects for the future need not be the same, and these differences open the door for a flexible, precisely targeted policy on the part of the West and, specifically, the United States.

The policy adopted by the Reagan Administration in response to the military coup in Poland suffers from a number of flaws.

- The world attaches little moral authority to a highly inconsistent defense of democracy and the rights of workers. This Administration's defense of Solidarity in Poland is seriously compromised by its support for the dictatorial regimes in Chile and Argentina, Central America, South Korea and elsewhere.

Adam Przeworski, is professor of political science at the University of Chicago. In 1967 he left his native Poland where he was educated and had worked. He is the author of a series of articles on social democracy and *Systems Analysis for Social Scientists* (1975).

- The Reagan policy is transparently self-interested: American objections to the West German gas pipeline long preceded the Polish crisis, and it is natural that the West Germans view with suspicion the choice of the pipeline as the focal point of the sanctions.
- The U.S. sanctions are too weak to dissuade the Soviets from intervening in Poland but they are strong enough to push Jaruzelski into a greater dependence upon the Soviet Union than might have been necessary.

Indeed, the policy of the Administration is so counterproductive as to lead one to suspect that its purpose is to mobilize the support of U.S. public opinion for Reagan's militaristic posture rather than to have any concrete effect upon the situation in Poland.

A policy designed to promote the development of democracy in Poland would be one that would allocate the responsibility for the coup d'état in a credible way, that would politically isolate the Soviet Union, and would increase the costs of the Soviet intervention. At the same time, this policy would place the Polish military junta in a situation that would deprive the martial law and the repression of any justification and any legitimacy.

Such a policy could exist, but it requires a degree of imagination and flexibility not now in evidence. This policy would consist of a conditional offer of massive economic aid to Poland—aid that would be so massive as to bail Poland out of its immediate economic crisis, provide the country with a breathing period sufficient to introduce economic reforms and make the potentially wealthy Polish economy operate again at full capacity. I am thinking of a commitment of billions of dollars over an extended period of time—a new Marshall plan.

I am not suggesting that this aid should be financed by restricting further the incomes and social services of those Americans who already suffer because of increased military expenditures. This aid should be viewed as a substitute for the guns, a substitute that would be strategically more effective than bombers and politically more popular than missiles.

The political condition for this aid should be the commitment of the military junta to free elections: a long overdue realization of the Yalta Agreement. The military government would immediately have to abolish the martial law, release all political prisoners, restore the rights of workers and relax the censorship. A caretaker government of national unity, composed of all the significant forces within Polish society, including the armed forces, would be charged with preparing for free elections, within a specified timetable and under impartial supervision.

Such an offer would deprive the military junta of the entire justification for the repressive measures it undertook in the guise of defending the national interest. The economic aid would provide a reasonable prospect of preventing the mass starvation and the political chaos, which the army maintains are the reasons for the martial law. Faced with the offer of such massive aid, the army could no longer claim to be simultaneously patriotic and anti-democratic. The prospects that such an offer would be accepted may be far from certain but the pressure to accept it, perhaps in some modified form, would be enormous.

Clearly, this kind of policy toward Poland would have to be accompanied by carefully calculated measures, closely coordinated with our allies, designed to increase the costs of any potential Soviet invasion of Poland. The United States cannot claim a strategic interest in Poland—this threat the Soviets could not and would not tolerate under any conditions. But it can claim a political and a moral interest in democracy everywhere, including Poland. The United States can actively and concretely support the right of the Polish people to self-determination by simultaneously helping to create the internal conditions for the development of democracy in Poland and warding off the threat of any foreign intervention motivated by strategic interests, including those of the United States. ☐

Behrendt, Amsterdam

Furthermore...

Profoundly saddened by Poland's fate, I was saddened even more by a television report on a recent Miami demonstration. Polish immigrants were joined by Cuban, Nicaraguan and other Central American expatriates, in welcome denunciation of military rule and government brutality. But these were Poles who worshipped Marshal Pilsudski (head of Poland's government between the Wars), Cubans who cheered the name of Batista, Nicaraguan supporters of Somoza, people who applauded the juntas of Guatemala and El Salvador. None appreciated the irony that today's Polish regime, the regime of General Jaruzelski, is in fact hardly different from those that they praise in other circumstances. None appeared to realize that the most determined core of Solidarity was (and remains) Marxist, proud of the Communist legacy of Rosa Luxembourg. This core of Solidarity, with deep roots in Gdansk, the shipyards and the mines, champions the very ideals that motivate also many of El Salvador's rebels.

Perhaps some of the same demonstrators had cheered President Reagan's decertification of the Air Traffic Controller's Union. "Illegal" strikers in Poland were freedom-fighters; "illegal" strikers in the United States were deprived of their livelihood, prosecuted and persecuted. The abrogation of rights was far more extensive in Poland, of course, but then government associated agencies in Guatemala have been responsible for more deaths during these last weeks than has General Jaruzelski. Differences in particulars may be less important than similarities of principle.

Poland's crisis has shown up, once again, the selectivity of professed ideals. Moscow applauds the freedom fighters of Central America, and gives them aid and succor, while orchestrating repression of the most elementary rights within her own sphere. Washington waxes equally indignant about the establishment of a "banana republic" in Warsaw, yet continues to prop up the equally illegitimate regimes of guns and death squads to the south. There reigns a nineteenth century mentality, a nineteenth century cynicism, a nineteenth century approach to international power politics, which is deeply disheartening, and deeply dangerous. A world of some 60,000 nuclear weapons cannot afford the tsarist approach to Eastern Europe and the world that Leonid Brezhnev seems to favor; nor can it afford the equally arrogant world views of a Lloyd George or a Clemenceau, which Reagan appears to have embraced. What makes it particularly dangerous is that Viceroy-type repression may be neither as effective nor as durable today as in bygone eras. One can only hope that the "mother countries" will not respond to continued unrest as did "mother countries" of the nineteenth century, though the arguments of the pessimists sound more plausible than those of the optimists.

For our beliefs to command respect, they must be beliefs of principle, not of convenience.

CARL G. JACOBSEN
Center for Advanced
International Studies
University of Miami
Coral Gables, Florida 33124

* * *

To: Professor Alexander Gieysztor
President, Polish Academy of Sciences

I have learned to my great distress that the actions of the Military Council of Salvation in Poland initiated by General Jaruzelski have resulted in the arrest, internment, and even brutal treatment of a tremendous number of Polish citizens. I speak in particular here of the actions taken last week against fellow workers at the Polish Academy of Sciences in Warsaw, including police and military entry into the Polish Academy of Sciences and universities, but my concern extends to all loyal Polish citizens affected in this manner.

As president of the National Academy of Sciences, I wish to express on behalf of myself, on behalf of this institution, and on behalf of the American academic community whom we serve and represent, our collective horror at the flagrant violation of the human rights of our colleagues in Poland, and our sincere desire to see these wrongs redressed.

Since 1966 the National Academy of Sciences has conducted a dynamic scientific exchange program with Poland. Existing bonds between the Polish and American scientific communities have been strengthened. We highly esteem the quality of Polish scientists and the accomplishments of Polish science. For these reasons, we cannot stand idly by while its best and brightest scientists are suffering unlawful arrest, detainment, and denial of basic freedoms.

It is with these concerns in mind that I wish to convey our deep sadness at the turn which events have taken in Poland and our hope that these great injustices will be rectified. You may rest assured that, in any such attempt, you will have the full moral support of millions of colleagues all over the world. I trust in the possibility of a positive resolution to this tragic situation, and look forward to learning of your response.

FRANK PRESS, President
National Academy of Sciences
of the United States of America
Washington, D.C. 20418

Has the intrusion of the Soviet submarine into the coastal waters of Sweden dampened the campaign for a Nordic Nuclear Free Zone?

MILTON LEITENBERG

The case of the stranded sub

At 8:00 P.M. on the evening of October 27, an old Soviet diesel powered Whisky class submarine, Number 137, ran aground outside of Karlskrona in southern Sweden within one of the two most important Swedish naval base areas in the country. The submarine carried no marking or identification, and it had had to successfully navigate past and between a series of outlying skerries, islands, rocks and grounds to reach Karlskrona.

The official Soviet statement claimed that the submarine was ". . . on an ordinary training cruise in the Baltic," and that virtually all navigation aids had failed simultaneously. The submarine captain claimed variously that he believed his boat was some 20 nautical miles north of the Polish coast when it went aground, or near the Danish island of Christiansö, north of Bornholm in the middle of the Baltic. A navigation error of that magnitude even with a simple compass is inconceivable, and without navigation aids the submarine would long before have run aground. Thus the submarine was not only far within Swedish territorial waters, but it was specifically within one of the two most highly restricted Swedish naval areas, and it had required very competent navigation, rather than the absence of any to get where it was. None of this was likely to have been random accident.

There is in fact one sense in which aspects of this event could be considered routine. Swedish government records of penetration by unidentified submarines into Swedish territorial waters, both certain and "possible," average about ten events per year. The recent records are:

1975, 15
1976, 10
1977, 12
1978, 5
1979, 7
1980, 11

The government assumes that there are other such events that it knows nothing about, and it is also assumed that the great majority of these, if not all, are by submarines of Warsaw Pact nations. The most notorious of these incursions took place in mid-September 1980 and involved an extended two-week hide-and-seek chase in the Stockholm archipelago, involving depth charging of the submarine.

The Swedish Prime Minister, Thorbjörn Fälldin, announced in a press conference on November 5, the evening before the Soviet submarine was to leave Swedish waters, that the government believed that the submarine "is in all probability armed with nuclear warheads," presumably torpedoes. As the submarine sat aground, its bow section somewhat raised, the Swedish Defense Research Institute began a series of radiation measurements from outside the hull. By the use of gamma ray spectroscopy, it was determined that about 10 kilograms (22 pounds) of uranium-238 was just inside the torpedo tube section.

The Swedish government "informed the Soviet Government that in all probability nuclear weapons were present on board the submarine. In order to be able to establish the presence of nuclear warheads with absolute certainty, further measurements and investigations of the torpedoes themselves were necessary. In view of this, we made a pressing request to the Soviet Government that Swedish experts should be given access to the submarine so that they could establish whether there were nuclear weapons on board."

The Soviet Union's note in reply, very significantly in Swedish government opinion, did not deny that there were nuclear weapons on board.

> "'The Soviet submarine 137 carries, as do all other naval vessels at sea, the necessary weapons and ammunition. However, this has nothing to do with the circumstances surrounding the unintentional intrusion by the submarine into Sweden's territorial waters.' The Soviet reply means, as far as we can see, that Moscow *does* not deny the presence of nuclear weapons on board. It also implies, although it does not actually say so, that the Soviet Government refuses to allow Swedish experts to carry out an inspection.'"

Had the Soviet Union denied the presence of nuclear weapons, there was always a possibility that the Swedish government would inspect the torpedo room by force of arms and prove the issue.

The submarine was released the next day. Upon its release, the Soviet Union rejected the Swedish protest note, complaining that the Swedish government statement was "devoid of any legal and factual grounds," that it had not displayed a "correct attitude" or made an "objective appraisal," and had violated

> "the generally recognised principle of international law under which a warship enjoys complete immunity from

Swedish journalists crowd a coast guard boat to get a close look at the Soviet submarine that ran aground in Swedish waters.

> the jurisdiction of any state other than the one under whose flag she is sailing.
>
> Even if a foreign warship fails to observe a coastal state's rules on passage through its territorial waters, the only thing the coastal state may do is demand that she leave its waters. . . ."

The comment about international law has interesting implications in view of the North Korean capture of the U.S. Pueblo and the year-long trial of its crew in 1969. The Soviet note did not once mention nuclear weapons.

An accompanying Tass dispatch however claimed that it was "NATO specialists" that had alleged the detection of uranium-238, that all of the allegations were "inventions, which are evidently intended for ignoramuses," and that everyone knows that uranium-238 is not used in nuclear weapons and that only uranium 235 and plutonium-239 are so used. The emission from these components cannot be detected through the thickness of the metal of a submarine hull, while those of uranium-238 or more specifically, those of some of its daughter products can. The use of uranium-238 as a jacket, reflector, or "tamper" in nuclear warheads is extensively described in a Soviet defense handbook published in 1958. This official Soviet source claimed that up to 80 percent of the total energy released in a thermonuclear detonation could be derived from such uranium-238 jacketing. Another Soviet official, interviewed in Oslo, claimed that the radiation the Swedes measured must have come from their wristwatches.

What is the relation of these events to the question of a Nordic nuclear free zone? Most simply a nuclear free zone means no ownership, deployment or use of nuclear weapons within a specified area, and additionally, possibly no transit of nuclear weapons through the area.

The idea of a Nordic nuclear free zone was first suggested by Soviet Premier Nikolai Bulganin to the Norwegian Premier in January 1958 during the preparation of NATO plans to deploy U.S. Thor and Jupiter intermediate and medium-range ballistic missiles in Europe. In May 1963 Finland's President Urho Kekkonen resuggested the idea during NATO discussion of a multilateral force. Kekkonen's plan would have covered the entire Nordic area, but *not* the Baltic, nor any areas of Soviet territory. Both of these occasions were thus during discussion of NATO plans for deploying nuclear weapons. As early as 1974, while reemphasizing the Kekkonen proposal, Soviet President Nikolai Podgorny declared that the Soviet Union would be ready to guarantee a Nordic nuclear free zone together with the other nuclear powers.

In 1978 Kekkonen repeated his suggestion during a speech in Stockholm. After a slight gestation period, the idea was taken up by others, in modified form. In a series of Swedish newspaper articles, Sweden's former ambassador Alva Myrdal proposed a reduced version of a zone, involving only Sweden and Finland. Both nations were already nuclear weapons free in all aspects, and it left aside the question of the NATO allies, Norway and Denmark. Ambassador Myrdal specifically excluded any suggestion of demands involving Soviet territory, but hoped, she said, that the proposal if effected would then spread to other unidentified European areas. The proposal would also specifically include guarantees from the nuclear weapon states to Sweden and Finland.

A restricted nuclear weapon free zone in an area surrounded on all sides by nuclear weapons meant quite a different thing than did a nuclear weapon free zone on an entire continent, for example Latin America. Ambassador Myrdal's suggestion can thus best be understood as an indication of desperation. It was 1980, SALT II had been killed by the U.S. Senate, and the European long-range theater nuclear weapons issue was raging. Anything, no matter how little or how purely symbolic, was better than nothing at all. But precisely because it was so little the suggestion was even more vulnerable to the criticism directed against all peripheral and partial measures. Even to obtain this would require substantial diplomatic effort, and in the meantime U.S. and Soviet strategic nuclear weapon accumulation would continue. The submarine aground at Karlskrona demonstrated the relation of Soviet seaborne nuclear weapons in the Baltic and in the Soviet Union's Northern Fleet, to the question of a Nordic zone.

It had been known that Soviet "W" or "Whisky" class submarines were capable of carrying nuclear torpedoes, and a large number of such submarines, built in the 1950s, are and always have been in the Baltic. The surprise was not that the Soviet Union

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had nuclear torpedoes but that such weapons would be deployed on so obsolete a vessel, in the Baltic, and on a submarine that was sent deep inside Swedish territorial waters on a hazardous escapade. The targets of Soviet nuclear torpedoes are U.S. aircraft carriers, and U.S. ballistic missile and nuclear attack submarines, but none of these are in the Baltic.

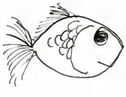
But if so ancient a Soviet submarine in the Baltic might be equipped with one or two nuclear torpedoes out of its total conventional complement, what of other Soviet vessels? The six old "Golf" class submarines carrying three short-range ballistic missiles and permanently based in the Baltic since 1976 had always been reckoned as carrying a full complement of nuclear warheads. However, there are cruise missiles on board both Soviet diesel powered and nuclear powered submarines in the Baltic and in the Northern Fleet as well as on board Soviet surface vessels, and these exist in a relatively large number of vessels and numbers of launch tubes. It had always been a matter of some conjecture as to whether these surface and submarine launched cruise missiles primarily intended for naval warfare and attack against U.S. aircraft carriers carried nuclear warheads or not, and if so, how many?

If one looks at the total number of cruise and short-range ballistic missile launchers in the Soviet Union's Baltic and Northern fleets that might potentially be armed with nuclear warheads, and excludes torpedoes, the numbers are quite large. In addition all of the Soviet Union's short-range ballistic missile submarines and cruise missile submarines have 8 to 10 torpedo tubes and carry a larger number of torpedoes. If a Whisky class submarine carries one or more nuclear warhead torpedoes, the same would be considered very much more likely, if not almost certain, for the various missile launching submarines.

In addition to all these seaborne nuclear ballistic and cruise missiles, the Soviet Union probably has about 1,000 nuclear weapons on medium-range bombers within range of the Nordic countries, and another 750 to 1,000 medium- and long-range theater ballistic missile warheads that could reach the Nordic areas. Though it is very likely that these weapons are *not* targeted on Nordic territory but on NATO's military installations and nuclear weapons in Central Europe, just as the Soviet Union's naval nuclear weapons are presumably targeted on the United States or on U.S. naval targets, nevertheless all of these weapons are capable of reaching targets in the Nordic countries. The sum is rather staggering: 3,000 to 3,500 nuclear warheads.

This brings us directly to the two remaining questions regarding a Nordic nuclear free zone: the extent of territory that it should include—and in particular whether it should include any Soviet territory—and the question of security guarantees or assurances.

Even before the Soviet submarine stranding incident, there had been more and more unanimity that the Baltic should have to be included. Any mention of the Kekkonen plan had nearly always drawn a comment on the obvious omission of the Baltic. The Soviet weapons in the Northern Fleet and on the Kola Peninsula were always considered too obviously involved in strategic interactions with the United States. The official Soviet government position, formulated largely in response to the public discussion of Myrdal's proposals, was stated on March 3, 1981:



> "Any agreement on a zone free from nuclear armament must also include nuclear weapons intended for goals inside the zone, deployed close to the zone and with a range making them suitable in the first place against targets inside the Nordic area."

In June 1981, Tass released a series of replies by Leonid Brezhnev to questions from a Finnish Social Democratic newspaper. Brezhnev offered Nordic nations a guarantee against nuclear attack if they proclaimed a Nordic nuclear free zone. He also implied that the Soviet Union would be ready to *discuss* its northern-based nuclear forces with Nordic countries if they agreed to such a zone. When asked what obligations the Soviet Union would accept on its own territory he replied:

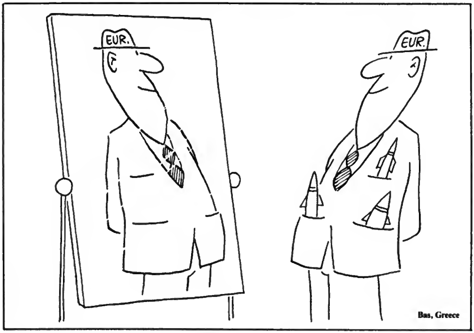
> "This does not exclude the possibility of discussing questions also about other measures involving territory of our own bordering on a Nordic nuclear weapons-free zone."

A few weeks later, Willy Brandt reportedly brought back a similar vague message after a visit to Moscow, and he urged the Nordic nations "to seek clarification from the USSR on the proposal." However, on July 23, the Soviet press agency Novosti made clear that the Soviet Union was not prepared to remove any nuclear weapons from the Kola Peninsula:

> "As far as Soviet territory is concerned, the military potential on the Kola Peninsula is part of the global strategic balance between the United States and the USSR, and is not aimed at the Nordic Countries."

Novosti also said that the sugges-

Another Soviet official claimed that the radiation the Swedes measured must have come from their wristwatches.



Bas, Greece

tion to include the Baltic was "illogical," since only inland waters of participating countries could be declared nuclear free. It suggested, however, that other territories adjacent to the Baltic and to the Nordic countries such as West Germany's northernmost state and the North Atlantic where U.S. submarines were deployed were as reasonable to include as the Kola Peninsula or the Baltic. The statement repeated however that Brezhnev "was ready to discuss . . . some measures in Soviet areas bordering on Scandinavia . . . with representatives from the Nordic countries." The judgment of Scandinavian politicians rather quickly became that the Soviet Union might be willing to "discuss" such questions, but would not include the reduction of any of its own weapons in return for a Nordic zone.

The question of Soviet security guarantees seems to be equally ambiguous. In his October 26 interview in *Der Spiegel,* Brezhnev again repeated that

> "The Soviet Union will, under no circumstances, use nuclear weapons against states which have renounced their production and acquisition and do not have them on their territory. We are ready to give contractual guarantees of this to any country, without a single exception."

Sweden has, however, been pressing the Soviet Union—and the other nuclear powers—for clarification of the question of guarantees from the Soviet Union since April 1981 in the Committee on Disarmament in Geneva, and has been unable to obtain them. The first Swedish request was made on April 16, 1981, and the second on July 9, 1981. It appears that the Soviet Union has some further conditions of its own, and wants the possibility to abrogate such agreements at times "of overriding national interest." That would make the agreement meaningless.

The effect of the stranding of the Soviet submarine and its probable arming with nuclear weapons has been to focus public and political attention a little more precisely on just what a "Nordic Nuclear Free Zone" actually would—and would not—mean. At the same time it rather seriously affected Soviet credibility in the region. But Nordic political leaders seem a bit more conscious now than they were before of the substantial number of Soviet nuclear weapons, aside from "strategic" ones, that are adjacent to their territory or that could be used within their territory. Removing a very small fraction of these—and going no further—would not have very great intrinsic value. Reduction in sizable numbers seems unlikely. Unconditional non-use guarantees therefore become crucial, and have yet to be forthcoming. People were embarrassed for their own ignorance and naiveté, which was made all the more evident by the Soviet Union's use in recent years of its favorite phrase for the Baltic as the "Sea of Peace," despite constant military maneuvers, "Golf" class ballistic missile submarines, and other naval nuclear weapons.

Public attention was directed to the Nordic nuclear free zone question by the 1981 Norwegian national election campaign. There are at least some indications that Finnish officials were very surprised at the turn of events in the rest of the Nordic region, and that Kekkonen's initiatives may have been made more to score points with the Soviet Union than in the expectancy that they would meet with approval from the other Nordic nations. Visiting Norway on behalf of the Norwegian Social Democratic Party in the last days of the election campaign, Chancellor Helmut Schmidt of West Germany curtly reminded Norway that it was a member of the NATO alliance, and that neither Norway nor Denmark could therefore consider such zones without the approval of its allies. The Norwegian conservative victory put an abrupt end to Norwegian discussion of a nuclear free zone. The submarine incident seems to have put the idea to sleep in general for the time being. ☐

WILLIAM C. BRUMFIELD

Post-war architecture and planning

By official estimates, over 70,000 cities, towns and villages were ruined in the Soviet Union during World War II, and about one-third of all urban housing space (some 140,000,000 square meters) was damaged or destroyed. This wholesale destruction, coming on top of what by Western standards was already an acute housing shortage, created problems of immense scope for Soviet architects, planners and builders. We continue our series on the Soviet Union with William Brumfield's discussion of recent Soviet efforts to cope with these problems.

Readers wishing to look further should consult Paul M. White's very helpful introductory guide, Soviet Urban and Regional Planning *(New York: St. Martin's Press, 1980). S. Frederick Starr,* Melnikov: Solo Architect in a Mass Society *(Princeton: Princeton University Press, 1978) is a fascinating illustrated study of one of the giants of Soviet architecture.*

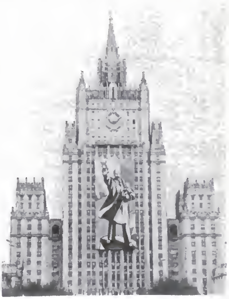
—James Cracraft
Special Editor

"Soviet architecture" is a slippery designation, not only because of zigzags in official policy concerning permissible styles—constructivist, functionalist, neoclassical, bureaucratic-pompous—but also because the Soviet Union is such a diverse aggregation of nationalities and cultures.

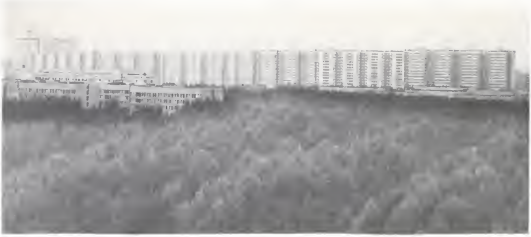
If one speaks of the architecture of Soviet Estonia or of Soviet Uzbekistan, does this imply a sub-division within a larger category known as Soviet architecture, or a distinctly national architecture? In fact, for reasons of cultural policies, the Soviets have tried to have it both ways: public buildings and housing developments in Tashkent and Dushanbe are likely to have "Islamic" decorative motifs incorporated into the design; recent architecture in Estonia shows the influence of neighboring Finland; and in the Caucasus the rough terrain has been exploited to achieve striking forms unknown in other parts of the Soviet Union. Climatic differences, geographical features, and distinctive cultural legacies unquestionably contribute to variations in architectural practice in the Soviet republics.[1]

Yet there can be little doubt that overall architectural policy is directed from Moscow. Moscow's influence extends to the setting of construction goals and the allocation of budgetary resources in the five-year plans, as well as to more specific questions of design and construction technology. The capital contains the headquarters of all major institutions concerned with architecture, planning and construction—including the state construction agencies (Gosstroy and Gosgrazhdanstroy), the Union of Architects (with over 13,000 members), and numerous research institutes, such as the Central Scientific Research Institute of Experimental Projects. Local autonomy may be tolerated, and even encouraged; but most large projects, be they in Tallinn or in Tashkent, utilize similar construction techniques and frequently the same basic designs.

The centralization of architectural planning—expected in a highly centralized state—has been intensified by the top priority assigned to rapid construction according to standarized plans and materials. In explaining this "industrialization" of construction, Soviet writers have noted the pressing need to rebuild the enormous amount of housing and industrial space destroyed during World War II. Yet the large-scale application of rationalized construction methods actually began some ten years after the war's end. The immediate post-war decade had been characterized by a number of grandiose projects (such as the seven "Stalinist Gothic" towers that still dominate the Moscow skyline); but the larger needs of society, particularly in housing, were being addressed by construction methods of pre-revolutionary origins. Furthermore, economic considerations received inadequate attention, so that large sums were expended on prestige buildings, while the majority of the population



Ministry of Foreign Affairs, Moscow. A typical example of "Stalinist Gothic" architecture decorated for the May 1 holiday.



Troparyova Housing Region, Moscow 1970s. In the foreground a green zone with alternating strips of conifer and birch.

lived in overcrowded communal apartments or in hastily-built barracks.

In 1955 the Central Committee of the Communist Party and the Council of Ministers responded to the housing crisis by adopting a series of measures aimed at transforming the Soviet construction industry.[2] Its thrust involved the implementation of industrialized construction methods based on the prefabrication of standardized parts and modules for assembly on site. In a process called *tipifikatsiya* (typification), architects and designers produced a catalog of building types and interior arrangements that could easily be adapted to large-scale, multistoried housing projects in a variety of settings. Such a system provided an effective means for constructing millions of square meters of housing and factory space quickly, at low cost, and without need of sophisticated technology. With a crane for lifting reinforced-concrete beams and panels into place, and a welder's torch to fasten the sections, the shell of an apartment building could be completed within a few months.

The results of two and a half decades of industrialized construction on a broad scale have been impressive —at least in quantitative terms. For example, during the Ninth Five-Year Plan (1971 to 1975) some 544 million square meters of housing space were constructed, thus providing new apartments for 56,000,000 people (the rule of thumb is roughly ten square meters per person). During the same period, around 100 new towns were founded, many of them in the Far East.[3] More recently, from 1975 to 1979 Moscow added 17.7 million square meters of living space (for 1.7 million people, most of whom were resettled from older parts of the city), completed four million square meters of industrial space, and built 82 schools and over 1,000 stores and restaurants.[4] The same tempo of construction is planned for the future.

These and other figures spew forth from the planning agencies, and are announced with a boosterism that would do credit to any U.S. Chamber of Commerce. To appreciate the results, however, one must wander among row after row of buildings—newly completed or still under construction—on the outskirts of Moscow, Leningrad, Kiev, or Vilnius. Any of these cities provide excellent examples of industrialized construction, and the Lazdinay region of Vilnius combines efficiency with a concern for aesthetic planning.

But Moscow's projects, by virtue of their scale and use of innovative building methods, are the most impressive. The names of old country estates, formerly on the outskirts of the city, now designate gargantuan new developments within the city limits—an area of 878 square kilometers defined by the Moscow Ring Road. These projects (Chertanovo, Troparyova, Konkovo, Strogino) are called "living massifs," and they are indeed massive: Strogino, nearing completion, will be home to over 150,000 people, many of whom have been moving in during the past two years despite the area's lack of adequate transportation and services. (This is a minor shortcoming for people who have been on a waiting list for years.)

The extent of new construction poses a number of problems for planners and architects as again Moscow provides the best example, although its problems are shared by Leningrad, Kiev, and other major urban areas. In the early 1970s, there were thoughts of limiting the city's population to seven million, but it is now over eight, and will continue to increase. To accommodate this number, planners have adopted a radial plan, with eight super zones extending from the city's core.[5] Parks and green areas are interspersed among the zones; and beyond the ring expressway is a green belt, within which are located satellite communities. Most regions of the city are already efficiently served by a subway system with several radial lines and a ring line connecting them; but the pace of subway construction is not sufficient to meet the needs of a city overwhelmingly dependent on public transportation. An overloaded and frequently dilapidated bus system must fill the gap for hundreds of thousands of residents in the outlying areas.

Moscow's demand for new housing and services is therefore restricted to an area sufficiently compact to be served by public transportation: suburban sprawl is not an option for Soviet developers. The available building space is further restricted by the need to provide open space, all the more essential as population density increases. The solution has been to design taller apartment buildings. At the beginning of the 1960s, the greater part of Moscow's living space consisted of buildings of five stories or less. With improved techniques of con-

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struction, the heights of mass-produced buildings increased: 10, 12, 14 stories. By the late 1970s apartment rows of 16 to 20 stories were not uncommon; and during the next Five-Year Plan such buildings are expected to comprise 65 to 70 percent of all new housing construction in Moscow.[6] A similar trend has occurred in Leningrad.

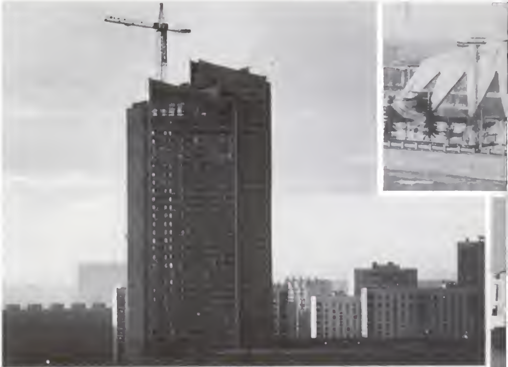
The increase in height has required an increase in technological sophistication, extending from such basic matters as structural integrity to such details as the design of efficient, reliable elevators. More care must now be given to the siting of buildings, in order to achieve the required minimum levels of sunlight exposure and open space.

New projects must make some effort to address the problem of design monotony in industrialized construction. Architectural publications frequently contain discussions of this problem in regard to both outward appearance and interior design. Partial solutions include the use of colored ceramic panels on the exterior, structural modification in the basic box design, and greater variety in the arrangement of interior space. Most new projects are still characterized by ranks of buildings stamped from a few standard models; but there are "experimental housing regions" which display greater creativity in the design of large housing masses. One such region is Chertanovo-North, designed for 22,000 inhabitants and located in south Moscow. In terms of innovative design and land use, and of such conveniences as underground parking complexes and shopping malls, this project offers a view of the latest concepts in Soviet urban planning.[7]

Whatever the project—be it for housing, administration, education, entertainment, or trade—Soviet architects are usually constrained by rather limited technological and financial resources, and by the narrow range of options presented by industrialized, mass construction methods. These limitations can, however, serve as a spur to the architect's ingenuity—as in the Children's Music Theater, one of the best of Moscow's recent buildings.

In a booklet devoted to the new theater, the project's designers—V. Krasilnikov and A. Velikanov—comment on the problems of working with prefabricated materials: "Architects are forced to use methods and construction materials worked out by construction and architectural practice, and this places its mark on the architecture of a building, especially under conditions of industrialized construction."[8] A close inspection of the theater's exterior gives one example of what the architects are talking about. Wishing to create a monolithic structure of simple geometric contrasts, but unable to use the techniques of poured, textured concrete that characterize Western "brutalism," the architects have sheathed the facade in textured stone and concrete panels. The seams that mark so much of contemporary prefabricated Soviet architecture are here integrated into the rough surface, thus adapting standardized components to a boldly-sculpted design.

The pervasiveness of prefabricated materials in Soviet building does not imply that the architects are locked into patterns of industrialized conformity. New techniques are being introduced, particularly in the development of poured ferro-concrete structures. As of 1980, poured concrete was projected to comprise almost half of the concrete used in the Soviet Union; and while much of this can be accounted for in foundations, dams, and certain industrial structures, poured concrete (or "monolithic" concrete, as the Russians call it) is being used with increasing sophistication, and with some awareness of its aesthetic properties. The most notable structure in this material is the Mos-



Central Tourist House (above), Moscow, completed in 1981. It illustrates two recent trends: increasing height and greater structural complexity. Universal Sports Pavilion, Moscow, 1979 (inset). An example of a large, unobstructed, covered arena, nicknamed "The Crab."

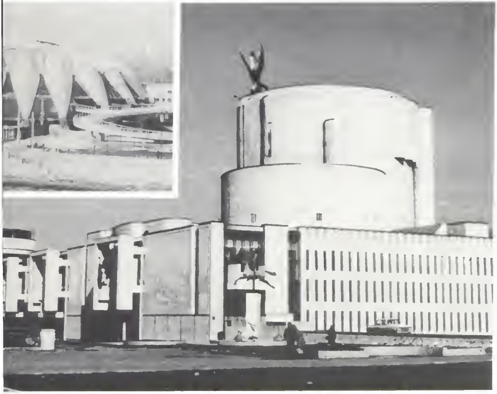
There is little of the interchange between Soviet and Western architects that characterized the vital period of the 1920s.

cow television tower at Ostankino. In recent years, a number of high-rise buildings have been constructed by raising a central concrete shaft from which the rest of the structure is draped.[9]

Other innovations in design and materials have appeared in cantilevered structures, covered stadiums, and buildings composed of complex geometric forms. A new bio-chemical institute in the south of Moscow, for example, resembles a diagram of a compound molecule (the return of *architecture parlante*). Furthermore, the legacy of Russian architecture's great experiment in modernism during the 1920s is being cautiously resurrected, as architectural journals include sketches and quotations from Lissitzky, Melnikov, and the Vesnin brothers. Yet the results of the attempt to create, or revive, a modernist aesthetic in Soviet architecture are mixed, to say the least. There is no clearly discernible movement or school; and while buildings of distinction have risen in Moscow, Leningrad, and in the Caucasus during the past decade or so, much of what passes for "modernist" architecture is overbearing and bombastic—something like recent American hotel architecture (the stepped pyramid, for example).

The problem is compounded by the fact that even showcase buildings in the Soviet Union do not achieve the luster of, say, the best American corporate headquarters. On this point a telling contrast is provided by Moscow's new center for international trade, designed and constructed under the supervision of Western firms. Although not particularly remarkable in conception, with its sleek gray frame and large window panels of tinted glass, the building stands out in its Soviet context. Indeed, when Soviet planners wish to build a structure intended to accommodate—and impress—capitalists, they will often hire a capitalist firm. The Finns have built a hotel tower in downtown Tallinn, the Swedes have built a large hotel on Vasilevsky Island in Leningrad, the French have built the grand Hotel Cosmos in Moscow, and in 1980 the West Germans finished the new (second) international terminal at Sheremetevo Airport. In some cases the entire work force has been imported, as have the materials.

In the future, Russia's leaders may also decide to buy abroad rather than depend on the local product. Yet there is little of the interchange between Soviet and Western architects that characterized the vital period of the 1920s, when Le Corbusier, Frank Lloyd Wright and the architects of the Bauhaus and of *de Stijl* knew their Soviet colleagues and occasionally collaborated with them. Perhaps this will change. In architecture, as in so much else, Russia has frequently assimilated ideas from the West and recast them in remarkable form. If the past decade in Soviet architecture has produced little that is remarkable, its accomplishments in mass planning and construction are impressive and warrant our close attention. ☐



Children's Music Theater, Moscow, 1979, adapts standardized components creatively.

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[1] Iu. S. Iaralov and M.I. Astafeva-Dlugach, *Samobytnost i natsionalnye osobennosti v sovetskoi arkhitekture* [Originality and national features in Soviet architecture], *Znanie*, architectural series, 1976 no. 9.

[2] See G. Orlov and K. Derzhinsky, *Sovetskaia arkhitektura. Tvorcheskie problemy* [Soviet architecture. Creative problems], *Znanie*, 1977 no. 8.

[3] Orlov and Derzhinsky, p. 12.

[4] Figures cited by N. Trofimov in "Moskva, 1980," *Stroitelstvo i arkhitektura Moskvy*, 1980 no. 1.

[5] See A.V. Ikonnikov, *Kamennaya letopis Moskvy* [Chronicle of Moscow in stone] (Moscow: 1978), pp. 46-51.

[6] Figures from A. Bekker, "Novye normy dlya zhiloy zastroyki Moskvy," [New norms for housing construction in Moscow], in *Stroitelstvo i arkhitektura Moskvy*, 1980 no. 1.

[7] Described in M.V. Posokhin and D.K. Diubek, *Eksperimentalnyi zhiloi rayon Chertanovo-Severnoe* [The experimental living region of Chertanovo-North], *Znanie*, 1976 no. 10.

[8] *Moskovskii gosudarstvennii Detskii muzykalnii teatr* [Moscow State Children's Music Theater] (Moscow: 1979).

[9] V.P. Belov, *Monolitnyi zhelezobeton* [Monolithic ferro-concrete], *Znanie*, 1977 no. 10.

The 1981 Rabinowitch Essay Competition invited members of the post-Hiroshima generation to address the "prospects and possibilities for eliminating the threat of nuclear war in Europe." We are pleased to present the winning essays.

In contrast to the 1980 competition on the more general theme of "How to eliminate the threat of nuclear war," the 1981 competition yielded a relatively small harvest of essays. Why this should be so remains something of a mystery. Perhaps it is a reflection of just how confounding Europe's nuclear dilemma is.

The two essays chosen by our judges to share the Rabinowitch Award dramatize the European predicament. Indeed, they can be said to represent the two dominant perspectives on the threat of nuclear war in Europe. Robert Grant's approach is pragmatic, his tone cautious. As he sees it, our options are severely limited. He argues that arms control is "the only alternative," and concludes, albeit with serious misgivings, that modernization of NATO *nuclear forces is warranted. Dave Myers' essay, by contrast, is informed by an expansive sense of possibility. A call to action, it presents the argument for a mass disarmament movement.*

Although the essays do not directly join issue with one another, each can be read as a critique of the other. It is our hope that read together in this fashion they will serve to advance the dialogue between those who advocate different means of achieving a common goal: the prevention of nuclear war.

Unavoidably these essays—submitted for a July 1, 1981 deadline—have in important respects been overtaken by events. Thus they do not take into account the resumption of U.S.-Soviet arms talks in Geneva, nor do they take into account the events that have, for the moment at least, eclipsed the light emanating from Poland. ☐

ROBERT GRANT

Necessary negotiations

In the foreseeable future there does not seem to be any way of getting rid of nuclear weapons; and it is not certain that, even if it were possible it would be wholly desirable. Nuclear weapons have helped to preserve peace in Europe over the last 36 years, and we must not forget that another conventional war in Europe would be devastating. The problem for the moment is not to eliminate nuclear weapons, but rather to maximize their advantages as a stabilizing military factor and to minimize the risk of suicide that their use in Europe would entail.

The problem of nuclear war in Europe is, of course, very much related to the overall East-West context, but it also has specific aspects that must be examined separately.

The dilemmas of extended deterrence. A pronounced change is currently underway with respect to credibility as the key factor in successful deterrence. In Europe, this question is hardly new. Since the late 1950s doubts have been raised about the credibility of the United States' extending its nuclear deterrent to protect its European allies. The interplay of three factors—East-West political relations, the East-West military balance, and the evolution of technology—seems to determine how credibility is assessed.

As the Soviet Union gradually acquired a capacity, in the late 1950s and early 1960s, to launch direct nuclear attacks against the United States, the American deterrent doctrine of massive retaliation against any Soviet aggression appeared to lose credibility. If it applied this strategy, the United States would expose itself to devastating Soviet nuclear strikes. Thus, the Soviet Union could view massive retaliation as very unlikely and be tempted to challenge deterrence.

Defense Secretary Robert S. McNamara's refinements of extended deterrence attempted to remedy this shortcoming. "Flexible response" was designed as a credibility-enhancing strategy, intended to make deterrence more effective. Many Europeans feared that flexible response was an American attempt to escape its nuclear commitment to Europe. But they gradually came to accept it, even though the doctrine also increased the likelihood of escalation to devastating levels of destruction. As long as everyone perceived a U.S. nuclear superiority over the Soviet Union, the credibility of flexible response was not challenged.

When Soviet-American strategic parity became a fact of life in the 1970s, a threat to the credibility of extended deterrence appeared once again. Secretary of Defense James A. Schlesinger tried to erase this perception by reinforcing the connections on the escalation ladder between theater nuclear forces and the U.S. strategic arsenal. Schlesinger emphasized counterforce targeting options for U.S. strategic forces in order to create the perception that the United States would not be committing suicide by defending Europe. Presidential Directive 59, issued in the summer of 1980, underlined the importance of flexible American targeting options.

However, many defense analysts and politicians, citing strategic parity and the technological developments of increased precision and miniaturi-

"Shall paroxysms of power politics be permitted to occur again and again, until one of them ends in disaster? To prevent this calls for rebellion—not a rebellion in the streets, with guns or knives, but a rebellion of minds and consciences; not a rebellion of peoples oppressed by dictatorial rule, old or new, and not the rebellion of oppressed nations against alien rule, old or new, but the rebellion of mankind against a system which sets parts of it against each other."

—EUGENE RABINOWITCH,
Editor and Founder
Bulletin of the Atomic Scientists

1945-1973

zation of charges, still claim that extended deterrence is not sufficiently credible.

One possible solution is for Europe to assume its own nuclear defense. Yet, even though independent French and British nuclear forces exist, no European government has the slightest intention of considering an independent European nuclear deterrent.

The favored solution of many members of the Reagan Administration is to rely almost exclusively on counterforce and damage limitation strategies.

Having nuclear options that the Soviet Union accepts as credible is an important aspect of deterrence. Yet, the exaggerated dependence on credibility, reflected in the increased emphasis on war-fighting strategies, can create a serious problem for deterrence.

Past efforts at deterrence in the nuclear age show that it is more likely to be challenged if the risks are thought to be calculable and unacceptable risks controllable.[1] The uncertainty of escalation to levels of enormous destruction is perhaps the most decisive factor for successful deterrence. The drive for theoretical maximum credibility moves toward eliminating this uncertainty. It is not easy to predict whether this development will have any practical impact. For the moment, the inhibitions on the use of nuclear weapons are likely to remain great no matter what doctrines are adopted. However, continued repetition of the notion that intra-war deterrence and escalation control will work could eventually have the effect of lowering the nuclear threshold.

Advocates of credibility-enhancing doctrines tend to overlook or downplay two important factors in deterrence. The first is the one of uncertainty already discussed. The other is the role played by political calculations and motivation in the willingness to accept risks. One study of deterrence asserts:

> "The critical role of interests and their valuation greatly reduces the value to policy-makers of norms and prescriptions concerning credibility which are offered by deterrence theory. The fact of the matter is that the task of achieving credibility is secondary to and dependent upon the more fundamental questions regarding the nature and valuation of interests."[2]

In a dispute between nuclear powers, the one that places the highest value on the objective will be ready to assume greater risks to achieve that objective. Since the end of World War II, it is clear that, whatever one thinks of their intentions, the Soviets have not been willing to assume great risks for the purpose of extending their sphere of control to Western Europe. On the other hand, the United States has continuously exhibited a strong political will to defend Western Europe. The argument that U.S. extended deterrence is not credible because of strategic parity completely ignores the question of interests and risk acceptance.

Continued reliance on the uncertainty of escalation to levels of massive destruction and the asymmetry of interests that each superpower has at stake in Western Europe seem to offer the best means of avoiding nuclear war in Europe. The problem is how best to insure that these two factors continue to play the same decisive role as they have during the past 36 years.

Preserving the asymmetry in superpower interests is complicated by the fact that the Soviet leaders equate national security with regime security.[3] In the event of a crisis threatening the regime, Soviet leaders could become sufficiently desperate to risk an attack on Europe.

Regardless of the military doctrine adopted, it is clear that increased precision, miniaturization of charges, and improved command, control and communications all undermine the stabilizing uncertainty of uncontrollable escalation. Continued technological improvements can perhaps create real options where today there are only theoretical possibilities. The strategic environment of the future may be one in which increased war-fighting potential combined with diminished calculability of the other side's intentions and force postures create growing fear and doubt.[4]

From a European perspective, arms control between the United States and the Soviet Union is more necessary than ever, in order to make it possible to deal with destabilizing technological developments. Despite its limited achievements in the past, arms control is still the only possible formula. The alternative, measures for unilateral disarmament, is unworkable. The argument that each superpower possesses such an overkill capacity that many measures of unilateral disarmament can be undertaken without endangering the nuclear balance does not take into account a multitude of questions.[5] The more fruitful approach would be to learn from the past failures and to devise more effec-

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tive strategies for arms control negotiations.

Progress on arms control is necessary for preserving the Atlantic Alliance. As long as those in the U.S. government favoring Alliance solidarity remain strong, European desires for arms control constitute an important pressure on the U.S. government. But Alliance cohesion will suffer greatly if Europeans perceive that the United States is not making a serious effort to negotiate.

Arms control agreements also appear to be the only way in which the United States can hope to counter the theoretical threat to their ICBMs. It is easier for the Soviets to add warheads than for the United States to construct new missiles; and ABM systems still do not seem very convincing. Arms control is important now that the deployment of the new MX missiles will perhaps be only half as large as originally planned, or will perhaps assume an altogether different form, with reduced theoretical survivability.

Those specialists who maintain that arms control must be subordinated to defense policy miss the point. Without arms control, the psychological anxieties over ICBM vulnerability will remain unresolved, and other anxieties will certainly develop. In short, arms control is the only alternative.

Theater nuclear forces and arms control. Theater nuclear forces underscore the fear of nuclear war in Europe. Europe can be devastated not only by the strategic nuclear forces of the superpowers, but also by a wide range of battlefield, medium-range and long-range tactical nuclear forces.

There has always been a great deal of ambiguity surrounding tactical nuclear forces.[6] Should they be used to regain a military advantage on the battlefield or should they represent a step up the escalation ladder, a warning to the attacker to desist or face increased destruction? Europeans have always favored the latter alternative because of its greater deterrent effect and because widespread battlefield use of tactical nuclear weapons would destroy the country in which they were used.

Many Europeans are understandably distressed by the increased accent on nuclear war-fighting. The key question is whether the technological improvements in precision and miniaturization of charges alter the fundamental nature of nuclear weapons. Is it possible to return to the classical notion that deterrence is assured only by a strong and viable defense? The concept of nuclear war-fighting has existed for over 20 years, but because of obvious technological limitations, nuclear weapons have been largely viewed as suitable solely for "deterrence by punishment." Do current technological trends now justify assertions that nuclear weapons are as acceptable as conventional ones for "deterrence by denial"?

Despite the optimistic prognoses of many advocates of nuclear war-fighting, the destruction that would be wrought in Europe is likely to remain enormous. If deterrence credibility is based on having non-suicidal options, Europe's maneuverability is very constricted. Even if nuclear war limited to Europe avoids Armageddon, many European states could effectively be destroyed as "viable twentieth century nations," to use Secretary McNamara's words. The current evolution in nuclear strategy threatens to leave Europe with highly self-destructive defense options and, because of the uncertainty of escalation, with an eroded deterrent threat.

The long-range theater nuclear force modernization to which NATO agreed in December 1979 reinforces the ambiguity over tactical nuclear weapons. European advocates support the modernization as a vital deterrent measure because it would reinforce the "coupling" of Europe to the U.S. strategic arsenal.[7] But the great precision of the Pershing II and cruise missiles permits their use against a multitude of military targets. They are weapons ideally suited for achieving battlefield military advantages, and many U.S. experts emphasize this fact. In addition, there are frequent statements that in a period of strategic nuclear parity "it is highly doubtful that theater nuclear weapons can be viewed as merely instruments for threatening escalation."[8]

It is these prospects that have created strong popular movements in many European countries against the limited-range theater nuclear force modernization. Some assert that the new deployment does not in fact reinforce coupling. The Soviets are not concerned with where a missile is launched; only whether it strikes their territory. The United States will be just as reluctant to attack the Soviet Union with theater nuclear forces as with its own strategic arsenal. In either case the Soviets would retaliate directly against the United States.

According to many opponents of modernization, the Soviet deployment of new SS-20 missiles does not really alter the situation in Europe. These weapons are more accurate and have lower yields than the former generation of Soviet intermediate range ballistic missiles, but Soviet ICBMs with similar yields and accuracy could be used against Europe with plenty left for the United States. On the other hand, the Pershing II and cruise missile deployment is viewed as destabilizing; their accuracy will enable them to hit Soviet command and control centers and even Soviet ICBMs. The Pershing IIs could reach their Soviet targets in approximately five minutes. Opponents of theater nuclear force modernization fear that in a moment of extreme crisis the Soviet Union would launch a preemptive attack against the new missiles. Furthermore, in densely populated Europe the missiles would not be sufficiently

Inhibitions on use of nuclear weapons are likely to remain great no matter what doctrines are adopted.

mobile and would be a tempting target to a Soviet Union that is paranoid about its security.

For the moment, the reasons in favor of modernization are more compelling. While modernization advocates tend to dismiss Soviet objections to the deployment as propaganda, its opponents are probably correct in indicating that legitimate Soviet security concerns are threatened by the deployment. The Soviets also perhaps perceive this deployment as setting a precedent for the future. But it is exactly those situations in which both sides have genuine anxieties about their respective security which would appear to offer good reasons for arms control negotiations.

It is highly unlikely that limited modernization will add to Soviet incentives to launch preemptive nuclear strikes in a crisis. The risks for the Soviet Union would be such that it would decide on this course of action only if it were committed to initiating war in Europe. In the event of that decision, the Soviet Union would probably launch preemptive strikes against the entire range of NATO military targets even in the absence of the new missile deployment.

The theater nuclear modernization is also perceived as a confirmation of the United States' political will and determination to defend Western Europe. It probably would be easier for a U.S. president to respond to a Soviet attack in Europe with theater nuclear forces before resorting to strategic weapons. If a sufficient number of the new missiles survived a Soviet preemptive strike, they would pose an important threat to Soviet territory. Soviet perception of these facts reinforces deterrence.

Above all, the deployment is necessary in order to preserve a sufficient degree of NATO cohesion. Those who are preoccupied with the dangers of the arms race and of new nuclear deployments in Europe do not have a monopoly on fears of nuclear war occurring in Europe. Groups and individuals who perceive the danger of a growing imbalance in Europe, to NATO's detriment, are also greatly worried about nuclear war in Europe. The fears of both sides are valid and deserve to be treated with the utmost seriousness.

In the absence of a minimum of consensus on security issues within NATO and within individual Alliance nations, the risk of nuclear war in Europe can only increase. The best way to maintain this cohesion is for NATO to proceed with modernization, while emphasizing that the deployment is to reinforce coupling and not to "win" a war in Europe. The United States has to make a serious negotiating effort, not only on the limited-range theater nuclear forces, but even more importantly on SALT. It is difficult to imagine real progress in other negotiations as long as the SALT process is blocked.

This analysis becomes irrelevant if one believes that the Soviet Union poses no threat to Western Europe or to its political independence. Indeed, this assumption forms the basis for the actions of some opponents of modernization. The extremely risky character of this supposition is obscured by the skillful way in which the Soviet Union has played upon the great diversity of perceptions and concerns within the Atlantic Alliance. The massive Soviet arms buildup, combined with declarations of peaceful intent, offers of negotiation, and threats against European nations which accept the new theater nuclear weapons, assured that no matter what decision NATO took, important segments of opinion within the Alliance would become dissatisfied and anxious. The Reagan Administration has, of course, helped the Soviet Union by its rejection of the SALT II Treaty and by its indecisiveness on arms control.

Continuing the same difficult and often frustrating policy on arms control is understandably unappealing to many people. But the situation hardly lends itself to dramatic solutions. Arms control negotiations and proposals such as the French one on confidence-building measures in Europe[9] are much more realistic than proposals for unilateral disarmament.

The conditions necessary for eliminating the threat of nuclear war in Europe do not exist, and will not for the foreseeable future. Conditions do exist, however, which make possible a variety of negotiations—on theater nuclear forces, on confidence-building measures in Europe, and on SALT. While there is little cause for undue optimism about such negotiations beginning and then succeeding, one can be hopeful. If progress in arms control is made, the fear of nuclear war in Europe will subside. If not, both the arms race and the strain within the Atlantic Alliance that could result will be far more dangerous than in the past. And will bring Europe one step closer to nuclear holocaust. ☐

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1. Alexander George and Richard Smoke, *Deterrence in American Foreign Policy* (New York: Columbia University Press, 1974), pp. 527-530.

2. Alexander George and Richard Smoke, *Deterrence*, p. 559.

3. Helmut Sonnenfeldt and William Hyland, "Soviet Perspectives on Security," *Adelphi Paper 150*, (London: International Institute for Strategic Studies, 1979), pp. 3-5.

4. William H. Kincade, "Over the Technological Horizon," *Daedalus* (Winter 1981).

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6. M. Leitenberg, "Background materials in tactical nuclear weapons," in *Tactical Nuclear Weapons: European Perspectives*, ed. Frank Barnaby (Stockholm: Stockholm International Peace Research Institute, 1978), pp. 3-136.

7. See interview with François de Rose, former French representative to the Atlantic Council, in *Express*, Jan. 24-30, 1981.

8. Richard Burt, "The Relevance of Arms Control in the 1980s," *Daedalus* (Winter 1981), p. 171.

9. On the French proposal read Benoit d'Aboville, "Le project sur le désarmement et l'Echéance de Madrid," in *La sécurité de l'Europe dans les années 80*, ed. Pierre Lellouche (Paris: Institut Français de Relations Internationales, 1980).

DAVE MYERS

The last Europe

After 35 years of carefully nurtured peace and economic recovery, Europe is ripe for another war. History bears this out. One need only look at the previous centuries of recurrent cycles of war, recovery, rearmament and war again to realize that it is high time for Europe to get on with her destiny. And if there are a few voices shouting that it must not be—no matter. There have always been fools or provocateurs or well-meaning novices at the game of power politics who are seduced by enemy propaganda. Who are they to block the inevitable, to hold back the crush of history? As for their naivete, just remember Chamberlain and Munich appeasement.

Thus armed with an historical mandate, the forces of war appear to have set about to select and interpret world events that will fulfill the prophecy, that will, in the end, vindicate their actions. A Soviet invasion of Europe could happen any day now, would happen if nuclear weapons weren't at the ready. Resurgent U.S. nationalism expressed with that unique American trump card, technology, adds nuclear cruise missiles to the 8,000-plus nuclear warheads already sprinkled about Europe. There are Russian boots on the streets of Kabul; robed Arabs destroying economies; Polish cries for freedom. Which of these will be the spark to ignite Europe once again?

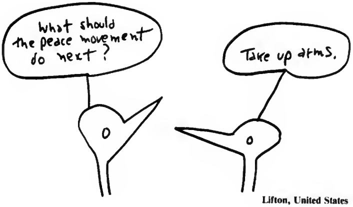
Unfortunately for Europe, her next war will be her last. Nuclear weapons will finally break the historical cycle; recovery will be next to impossible and, if the war approaches even the mininum horrors the military expects, recovery may not be desirable. A Saharan Europe will not inspire much of a renaissance.

The choice for the European nations therefore becomes rather straightforward: Is the pattern of history to be blindly repeated just once more, at which point both European history and future become moot; or is the pattern to be broken, so Europe can have at least a chance at a future? Now would appear to be a gloomy time to have to make the choice: The world is unsettled, the United States and NATO countries have adopted a policy for fighting "limited" nuclear wars, technology has made annihilation more probable, terrorism is becoming almost acceptable politics and European economies are reeling. Surprisingly, however, it is now that the alternative of peace has a high chance of success. It is at such times, when the *status quo* is questioned and when international relations are in flux, that a real change in the direction of a nation's future can happen. The future need not be more of the past. The dangers are that either the wrong choice is made, as it was in the 1930s when war was the preferred future, or no choice is made and Europe drifts to war—the 1914 analogy. And while the question of war or peace has always been asked in times of tension, it is the nuclear factor that gives the choice such an urgency today. It is Europe's last chance.

There is no shortage of ideas for future peace in Europe. Some are common sense, others innovative, but almost all would work to some degree. In vogue are proposals to cut arsenals by half and a nuclear-free zone from "Portugal to Poland." Either will work, perhaps not perfectly but at least as a start. Why, then, is nothing happening? Why is Europe's future being decided by default? The answer is that Europe is being held in the dual grip of military momentum and government inertia. The military momentum is sustained by superpower policies; the inertia is fostered by indecision.

The basic logic under which each superpower's military operates in Europe comes from Pearl Harbor or Hitler's attack on Russia. Military policies today rest on the assumption that, given any low-risk opportunity, either the Soviet Union through the Warsaw Pact, or the United States through NATO, will attack without provocation. From that starting point it is relatively easy to proceed through the argument that to keep risks to an attacker high a deterrent force is needed, the best deterrent is a devastating nuclear force, the nuclear force must be superior to the other side's nuclear force (otherwise it could be knocked out in that unprovoked attack) and therefore it is necessary to retain not only vigilance but unchallengeable nuclear arms.

The arms race that results from this logic is itself a provocation and therefore is proof of the logic's soundness. That such logic is circular means that no rational method can solve the European problem as long as the basic assumptions and arguments are accepted. Even to question this logic or to point out the abuses attendant on the arms race—personal gain, political maneuvering, mistaken intelligence—is to be drawn into the morass


What should the peace movement do next?
Take up arms.

Lifton, United States

of facts, half-facts, whole lies, sophisticated analyses and sophistry that now surrounds national debate and the questioning of European or superpower nuclear policies.

It is not necessary to do so. To begin the process for a European peace it is merely necessary to look at the tangible results military momentum has had in the past few decades.

After World War II, military entrenchment in Europe provided stability and a transition from the war to recovery. Europe was rebuilt; Western Europe completed her economic miracle. Nuclear war was a possibility then but was considered a risk worth taking in order to achieve the recovery. Nuclear weapons were for a deterrent and were therefore aimed at cities and populations—a "countervalue" strategy. However, the momentum kept pushing each superpower to be superior, stronger, more aggressive; neither was (or is today) willing to be second. While this desire to be first worked in a non-nuclear age—kill your enemy and you become more powerful—the advent of nuclear weapons meant that it does not matter who strikes first—kill your enemy and you too will die.

Carefully circumventing this new nuclear truth with more nimble logic, military buildups have continued, creating new dangers for Europe:

- First, the superpowers decided that if there is to be a war, why destroy each other? Why not use their respective surrogates as battlefields and keep the superpower land masses and populations intact? The defense of the homeland now starts with the allies or comrades—Western Europe, Eastern Europe, it makes no difference; both will go.
- Then came the realization that commitment to one course of nuclear action is a vulnerability. Having accepted the nuclear arguments and pressed them in the face of reason, governments which renounce them now would be confessing to having been bamboozled which, of course, is a political kiss of death. Thus the momentum has fossilized European government action and has made indecision inevitable.
- Next the superpowers learned belatedly the operational limitations of having nuclear weapons for a deterrent. Deterrent weapons cannot be used in a small fight which effectively reduces military options available for a "limited" nuclear war. This situation is an almost intolerable frustration for military planners. Retired Rear Admiral Gene LaRoque pointed this out at the recent Gröningen Conference on Nuclear War in Europe when he said, "We in the military don't go into these organizations and spend our lives at it to try to fight a war to a draw. Our business is to fight a war to a victory. So we're constantly trying to get better, more accurate, more powerful weapons to win a war." This is military momentum reduced to its simplest terms. And it is in the natural sequence of that momentum that the next step will be to deploy nuclear weapons not for deterrence but for use, for victory.

Technology, of course, has kept apace. Today the deterrent forces are more reliable and accurate and, the world is told, can be targeted to hit only military installations—a "counterforce" strategy. Now the talk is of "surgical strikes" and "silobusters." The Pershing missiles to be stationed in Europe signal clearly that the West aims to fight and win.

This single shift in policy from countervalue to counterforce has had three near-term consequences:

- Nuclear weapons are now for tactical use and are therefore available to each ground commander for, say, closing a mountain pass or diverting a tank column;
- Nuclear weapons, because they are tactical, are just other bombs to be regarded as any high explosive;
- Most distressing of all—nuclear weapons are now for offense, not defense, so the country that continually builds and deploys them for tactical use has taken the first step to being the first to attack.

The upshot of the policy shift to counterforce has made nuclear war a distinct possibility and has made that traditional tactical battleground, Europe, the most likely place for the war to happen.

There is also a disturbing long-term consequence to the policy shift. For years American and Russian leaders told their European allies that any attack would be met with a superpower response. Such wisdom was accepted and, at least in NATO's case, welcomed. But now that wisdom has changed.

What is to keep the current wisdom from changing in the future? How far will the military go in its quest for victory? Will attack on warning become policy? Will a pre-emptive nuclear attack become necessary? Will unavoidable technological advances in future

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weapons lead, as past ones have, to more aggressive policies to take full advantage of the technology?

The words of George F. Kennan, former U.S. Ambassador to Moscow, become even more pertinent: "Modern history offers no example of the cultivation by rival powers of armed force on a huge scale that did not lead to an outbreak of hostilities. And there is no reason to believe that we are greater, or wiser, than our ancestors."

The response of the superpowers to European concern about the military momentum has been, predictably, rhetoric, platitudes and more weapons. The response of the European governments has been, sadly, handwringing inertia. Perhaps it must be so. Eastern European countries have not changed much without prior Soviet approval; Western European countries won't, for fear of jeopardizing the economic benefits and security assurances that come with NATO. Placidly, the Soviets speak of peace conferences and continue to deploy their "defensive" weapons, caring little, it seems, that those weapons are disrupting Europe's military balance, increasing the terror and solidifying the inertia. Conversely, the Americans cry in pain at deception, danger and the Soviet adventure, forgetting, it seems, that the latest Soviet weapons began to be developed after the Cuban missile crisis as a means of making sure that the Russian humiliation from that crisis never happens again.

Action is needed. The possibilities for eliminating the nuclear threat from Europe are based upon motivating European governments to act in a manner that redirects the thundering military momentum. Fortunately, two simultaneous and complementary events now taking place in Europe can, when coupled, provide the basis for such action for peace.

In Western Europe a popular movement is becoming increasingly strong and vocal, protesting the planned deployment of new theater nuclear weapons on European soil; in Poland a popular movement has challenged the authoritarian rule of the Soviet Union. In both cases Europeans are challenging the superpowers. Both are true popular movements, as the initiatives and vitality come from working people of the streets and fields, not from the parlors of the intelligentsia. Thus from both Europes comes the same basic struggle for self-determination, clothed in the issues most important to each: an end to nuclear terror and the reestablishment of basic human rights. If the process undertaken in Poland is adopted by the anti-nuclear forces in Western Europe, a formidable movement can spur Western governments to action for peace. And if the West takes the initiative, the groundwork is laid for the Soviets to follow. It would be an all-European solution to European problems.

There is no guarantee that the Soviets would follow this lead; they may wish to remain, in the words of one of their disarmament negotiators, "neither pacifistic nor philantropic." However, facing a gloomy future of unrest in Eastern Europe, food shortages, Afghanistan and a growing threat from China, the Soviet Union might be willing to give peace in Europe a try. But even if the Soviets don't, a process and organization will have been established through which the superpowers can meet and talk on an ad hoc basis, to negotiate "by the back door" where official posturing need not obstruct substance.

Absolutely essential for the success of this coalition of action and a non-nuclear future is that violence, or even the threat of violence, never be used. Such a process of militant non-violence, while new to Europe, is old to the rest of the world. Solomon knew the wisdom of patience and nonviolence in politics: "By long forebearing is a ruler persuaded, and a soft tongue breaketh the bone." More recently Mohandas Gandhi used militant nonviolence to dismantle the British Empire, the superpower of its time, in India; Martin Luther King, Jr. used the same tactics to overcome established racism in America.

Today Poland's Solidarity uses a mixture of non-cooperation and nonviolent protests pervaded with modesty. If the government threatens harsh treatment, Solidarity announces a strike; if the government concedes, the strikes are cancelled. Consequently, no showdown is precipitated and neither side is maneuvered into a corner. As the government and Solidarity begin to intertwine in their common causes it becomes harder and harder for those who favor violence to act. Lech Walesa has also been careful to ensure verbal nonviolence; there have been no rhetorical obscenities aimed at Russia nor have there been refusals to talk. There have been talks and talks—but no blood, no fighting. Governments cannot fight this type of activity. There are no threats, no targets, no leadership to be dealt with sternly, no power structure to dismantle.

With sufficient popular support, these same tactics of militant nonviolence in other European countries can eventually produce a non-nuclear future. Organizations amenable to the non-nuclear, nonviolent philosophy are in place and growing. According to E.P. Thompson at the recent Grönningen Conference, large but increasing minorities of people in England, Holland and Norway favor some form of disarmament, including unilateralist action. In the Nordic countries a very powerful lobby is pressing for a nuclear weapons free zone comprising Finland, Sweden, Norway and Denmark. The French have voted in a left-

Europe could lead the superpowers out of the nuclear stalemate.

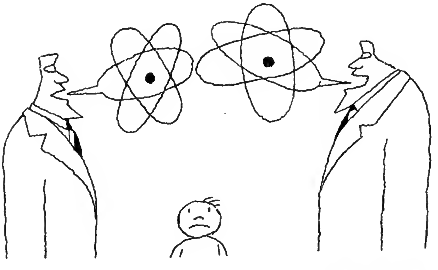
ist government, and even in West Germany the grassroots refrain is growing. If these concerned organizations can be convinced of the potential of nonviolence and rallied to its principles, Europe stands only to gain.

Rallying people to a nonviolent strategy is fundamental politics without the usual underlying arrogant grab for personal power. That alone will attract many of the disenfranchised. Others may come for the challenge or intellectual purity of nonviolence. In short, there needs to be a spectrum of reasons for Europeans to embrace militant nonviolence and to commit themselves to its principles. Each country will probably need some event or series of events to arouse its people; and in each country there will be those who know best how to galvanize their populations.

In Western Europe, indignation over being manipulated by the United States may be the call for action. For example, President Reagan's current domestic policy has European acquiescence as one of its key features. He has asked the American public to accept austerity and economic sacrifice but realizes that such acceptance is more likely if there is an external enemy or threat to America. This is an old political ploy: fear of an outside enemy promotes internal political repression. Thus President Reagan talks in the same breath of cutting the budget and stopping the Russians.

The keystone to this policy, beyond interpreting current Soviet actions as direct aggression aimed at America, is that Europe must follow Reagan's lead because Europe is the focus of the perceived threat. Is Europe ready to take the nuclear risk and, concurrently, give up some of its self-determination so that the American people will voluntarily accept economic restraint? If supply-side economics doesn't work, will the anti-Soviet rhetoric become more shrill, the threat more ominous, and will ever more weapons be put on European soil? No one likes to be manipulated, particularly by a friend telling you it's for your own good. Intended or not, that is exactly what Reagan's policies are doing.

Militant nonviolence for nuclear disarmament may also gain support from those who question Western Europe's economic future. If Western Europe accepts the treatise that NATO forces must run on the same weapons-spending treadmill as the United States, more funds will be drained from social welfare programs; taxes and interest rates will increase; investment capital will become more scarce while Europe's military may actually become less effective. The cost of military airplanes illustrates what could happen to European forces if America's military spending patterns are adopted. In 1944 America built 10,000 military airplanes; in the 1950s, as costs rose, the annual rate of production was 3,000; by the late 1970s about 400 fighters were purchased per year; in 1982 fewer than 250 will be built. Cost per aircraft has risen by a factor of four every ten years and, if the trend continues, by about 2054 the entire defense budget will be used to purchase one tactical aircraft. The American Navy and Air Force will have to share the plane, 3.5 days a week for each.



Valerry, West Germany

Facetious? Maybe. But consider Paraguay, land-locked and traversed by only two major rivers. Paraguay had, at last count, one gunboat to patrol the rivers and 12 admirals in its navy. Each admiral gets the boat for a month. True, their uniforms are magnificent. But the possible Paraguayization of Europe should give even the military pause.

As this peaceful action spreads throughout the continent, it will either produce a non-nuclear future and a freer Eastern Europe or, at the minimum, will create an atmosphere in which the superpowers can begin to negotiate in earnest. Europe could therefore lead the superpowers out of the nuclear stalemate.

By shunning its traditional destiny and acting with commitment, persistence and nonviolence, Europe can assure its future. But if the European nations are paralyzed with fear and indecision, history will repeat itself once more and today's Europe will be the last. □

The small villages of India have been cut off from the economic and social changes of the major cities. How to reach out to rural concerns and poverty is the subject of this article.

DAVID SECKLER and DEEP JOSHI

Sukhomajri: water management in India

Sukhomajri is a small village about 20 kilometers from Chandigarh, in the state of Haryana, India. The villagers have traditionally obtained their livelihood through primitive, rainfed agriculture and livestock grazing, with some employment opportunities in a nearby cement plant. Until 1980 they had no road to their village and, indeed, not even a bullock cart.

There are thousands of villages in India similarly isolated from the mainstream of economic development. If their economic condition has changed in the past few centuries it has been for the worse as population pressures and overgrazing have eroded their natural resource base.

The Hindi word "Sukhomajri" can mean one of two things: "prosperous little village" or, with a slight change of inflection, "dry little village." The objective of our program is to place the right inflection on as many "Sukhomajris" in India as possible.

The Indian Council of Agricultural Research has energetically supported "operational research" projects through which scientists from various Council research centers go out to the field and work with farmers in implementing and testing new agricultural practices. The program has not only improved productivity but has also provided an essential feedback of information and real world problems to the scientific establishment. In 1975 the Central Soil and Water Conservation Research and Training Institute, with support from the Ford Foundation, "adopted" two remote villages under this program. Sukhomajri is the one we shall look at here.

The objective of the project was to improve the soil and water resource base through introduction of good conservation practices. But the scientists soon learned that when working with people who live on the margin of subsistence, the conventional approach to resource conservation will not work. These people cannot save resources for the future through reduced current consumption, nor can they direct resources from present production to invest in increased future production.

Savings, or investment, is the difference between income and consumption. When people consume all their income, and even then live only at a subsistence level, they cannot be expected to save and invest. This economic law soon became apparent at Sukhomajri. All programs that diverted resources from current production—controlled grazing, fruit tree planting, exhortations not to cultivate "lands unsuitable for agriculture"—failed for lack of village cooperation and, at times, because of outright opposition. But programs with an immediate payoff commanded the enthusiastic support of the villagers. The strategy then became one of using development programs to provide the economic and social basis for conservation programs. Once villagers have a productive resource in hand, they will indeed conserve it.

The centerpiece of the development program was irrigation followed by improved seed varieties, fertilizers and changed cropping systems. Over India as a whole, irrigation and related developments generally will double both crop yields and labor efforts per unit of land. Thus, even landless people benefit from improvements, through lower (or less rapidly increasing) food costs and increased employment opportunities in agriculture and related sectors. The final results of the work in Sukhomajri are not yet in, but it is not unlikely that they will show that agricultural income has increased by one-third to one-half to date, and will probably double within the next two or three years. With increased income, the villagers are already adopting conservation measures to preserve their new life.

At Sukhomajri, a small dam was installed at the foot of a severely eroded ravine immediately above the village. An underground pipe conveys water from this dam to about 80 acres of village lands. The villagers at Sukhomajri understand that if they overgraze the watershed to their dam it will soon silt full and they now carefully control grazing and woodcutting. The reservoir is being used as a supplemental source of drinking water and for recreation, while the micro-climate created in the watershed has resulted in a rather spectacular growth of trees, bushes and grasses. With this model, the Forest Department is constructing similar tanks to provide shelter and drinking water for wildlife in this arid region as well as additional fuel and fodder supplies to other villages.

With increased agricultural production several other conservation measures are being implemented. The supply of fodder from crop residues has increased, reducing grazing pressure on non-agricultural lands. Farmers are grading, levelling and building

There is a law of rural development projects: they all work at the start, and most fail at the end.

embankments on their lands both for irrigation and to prevent erosion of this now valuable asset. Old eroded lands are being reclaimed as well. And finally, the scientists have established their credibility with the villagers. With more economic "slack" in the system, recommendations for investments in fruit trees, vegetables, and the like—rejected by villagers at first—are being undertaken.

Looking back one begins to appreciate the ecological context within which village life is largely determined. The village lives on the energy from the food it has grown. The food is in turn produced by energy inputs from human and animal work—together with materials such as dung fertilizer and cooking fuel from surrounding non-agricultural lands. A delicate equilibrium is established where work is performed down to, but not below, the real marginal cost of work; at any return below this, it becomes rational to be idle.

A major function of animals is that of soil nutrient gatherers, dung producers, for agricultural lands. In the Himalayas about 80 percent of all the animals are kept only for dung production. But animals also expend energy in this function, so that the fertility of agricultural land is limited by the grazing range of animals. This, of course, leads to overgrazed areas around villages. The same energy equilibrium is established in fuelwood gathering efforts. This ecological system will naturally reach an equilibrium, with human and animal energy product equal to energy cost on the margin; but the natural equilibrium is one of starvation, denudation and erosion. This system cannot be changed merely by changed thinking, nor by a different social order. It cannot be made more "rational" because, under the circumstances, it is already "rational." What is needed, as economist Theodore W. Schultz has long insisted, are "new inputs" to which the villagers can, and will, rationally respond.

There is indeed a kind of law of rural development projects: they all work at the start, and most fail at the end. Nor is it difficult to understand why this law operates:

- At the beginning, all the best people—dedicated, determined, with the enthusiasm of a new venture—are thrown into the operation.
- Resources are moved from other activities to assure that the demonstration project succeeds.
- It is always easier and more fun to construct new facilities than to maintain old ones.
- Perhaps most significantly, the clientele—the villagers in this case—are caught offguard in the first flush of success and have not yet got down to the hard business of dividing the spoils.

In a word, the Sukhomajri program has entered its most dangerous phase. The gains must be consolidated and solidified. Then an organizational and managerial structure must be evolved to carry these models out to hundreds of needy villages in a responsible, cost-effective and durable program. We shall concentrate here on what is being done to consolidate gains in Sukhomajri and then explore what must be done to see this program through to the end—perhaps a century from now.

Sukhomajri illustrates the close interrelationships between physical resources, technology and social structure. These interrelationships provide both constraints and opportunities which are now on the project agenda.

In order to understand the present situation it is necessary to understand the past. It is a classic instance of serendipity. The Chandigarh Center of the Central Soil and Water Research and Training Institute quite literally backed into the project. The original problem was the rapid sedimentation of Lake Sukhna in the model city of Chandigarh, capital of both Punjab and Haryana. The lake would have vanished in a few years and the city fathers embarked on a costly dredging program to save it. P.R. Mishra, director of the Chandigarh Center, recognized the ultimate futility of this program, and determined to tackle the cause. He launched an ambitious project of watershed conservation in the catchment area of Lake Sukhna.

Pursuing this program, he systematically worked his way back from Chandigarh to the head of the watershed, some 15 kilometers away, and there he found Sukhomajri, where he noticed a particularly vicious little watershed that was flooding and destroying agricultural lands. Deciding to do something about this problem, he introduced conservation measures in the watershed and created a check dam to stop downstream destruction. When the dam was in place there naturally appeared a sizable body of water. This water could be used for irrigation. And here we are!

Since irrigation emerged as the virtually unintended result of a conservation project, it was originally conceived as a conventional gravity system. But now that irrigation has become the *dramatis personae* on the stage of Sukhomajri, four basic facts have come into perspective:

- The land is very hilly and undulating. Costs of grading and levelling the fields for gravity irrigation are exorbitant and providing effective water distribution to the fields difficult.
- The land is mostly sandy loam, and as water runs through earthen distributories and over fields much is lost to deep percolation.
- Since only half of the farm households in the village have land within the natural command of this system, half of the village is prospering while the other half receives little,

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if any, project benefit at all. In fact, relative status relationships, so important in village life, have worsened. Inequality has skewed dramatically, and the "have nots" resent, and may indeed sabotage, the project as social tension accelerates. There is also a great deal of jealousy and agitation from surrounding villages.

- Now, while people are learning the benefits of irrigation, there is an excess supply of water. The more advanced and generally larger farms are using it very little, if at all. Worse, the progressive farmers are beginning to use the surplus water in the summer season for high-water-consuming rice paddy, sugarcane and maize crops while the project is premised on only supplemental irrigation for winter wheat production. Once these practices become established, it is going to be very difficult to change them as the other farmers catch up and water becomes increasingly scarce.

The project managers are well aware of these problems and have decided on two measures. They will convert parts of the gravity system to sprinkler irrigation as a solution to the physical problem of efficient conveyance and application of water; and they will impose a rigorous, legally enforced *warabundi* (rotation by turns) system of water allocation among users.

The sprinkler system is in operation on a 4.5 hectare pilot basis, on land outside the old, gravity command. Thus, during the winter all the village farmers will have irrigation, some by the gravity system, the rest by the sprinkler method. And all will be operating under a rotation system legally implemented.

The sprinkler method makes rotation by turns at once easier and more difficult. It is easier since the flow from the outlet is a constant (under given pressure), and the farmer can easily "see" if he has in fact received his allotment simply by putting two or three glasses in the field under the sprinkler and watching them fill up. It is more difficult because, with pressurized pipe conveyance of water, there is no natural limit to the command area. Thus the potential demand for water far exceeds the supply and the burden of determining who is to get water, in what amount, is passed from nature to human managers.

The issue eventually reduces to whether the water is to be allocated to the land or to the people. The conventional mode is simply to allocate water to adjacent lands according to estimated irrigation requirements. Large landholders would naturally receive more water than small landholders. The alternative is to provide all landholding households with the same amount of water, up to the limit of their irrigation requirements.

The decision was to allocate water first to the people and only secondarily to the land. Thus every landholding household will get a base amount of water. Indeed, in the case of landless village households, attempts will be made to get them both a small piece of land *and* water.

In addition to the obvious equity aspects of this allocation system, there are some very practical aspects to which we have alluded. It is believed that only if all villages benefit from the project, and only if they benefit in a reasonably equal way, will the project survive the conflicts and jealousies that would otherwise develop. One cannot, for example, reasonably expect a man with no vested interest in the system to keep his cattle out of the watershed. Neglect of these distributional realities is an important reason why projects tend to fail.

Some may question the high level of technology used at Sukhomajri. Even the pipe system represents a higher level than is usual in India. What happened to "appropriate technology"?

The answer is that if one means by this phrase the usual "1920 Montgomery Ward Catalogue" technology, it is usually *inappropriate* for rural development projects in very poor areas. In the words of Colonel B.L.

Goats denuding steep hillside exemplify one of the causes of Sukhomarjri's water problems.

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Verma, director of the water division of Action for Food Production, "The poor need the best technology because they have the worst resources."

The project has concentrated on establishing the technical and organizational infrastructure at Sukhomajri. Once it is established, a village water users association should be able to undertake collection of water charges, repair and maintenance of facilities and enforcement of the rotation system, and to assure continued equitable distribution of water. This is the *hope*. What can be done if the hope is not satisfied?

Over the next year or so the Sukhomajri project will be tranformed into a program—that is, to an organizational and managerial structure for many such projects. A core group has been formed within the Institute to learn, and then to train others, in the technical and social aspects of these projects. This group will complete additional projects in three even more isolated and poverty-stricken villages in Haryana.

In India, rural development projects are typically carried out by one of two polar kinds of organizations—with very little in between. The first kind is the state government agency. The second is the "voluntary agency"—something close to a philanthropic, non-profit corporation.

Each has its advantages and disadvantages *vis-à-vis* the Sukhomajri program. Put briefly, state agencies are too specialized and centralized while volunteer agencies are too generalized and location-specific, for this particular task.

- The state agencies clearly can make essential contributions to the Sukhomajri program, but the program does not fall exclusively, or even mainly, within the purview of any *one* agency. Also, these are very small, local projects requiring on-the-spot adaptation, decision-making and flexibility well beyond the routinized procedures of a state agency.
- The typical voluntary agency has neither the technical expertise, equipment nor managerial capacity for such a large technical program. They can, of course, provide extremely important services from dedicated people as well as local organizational ability for specific projects. But these are not adequate for the overall program. An instructive exception to this rule is Action for Food Production (AFPRO), a large voluntary agency specifically designed to provide technical advice, equipment and management to other smaller and more localized voluntary agencies. This group has already provided important assistance to the Sukhomajri program.

Sukhomajri dam and watershed.

It is tempting to think what is required for Sukhomajri is another such group ("Son of AFPRO," as it were). But since Sukhomajri will be an operating entity, financed mainly by international funds channeled through the Indian government, it must be under official government control and supervision. The solution clearly lies in the direction of a hybrid organization which would be essentially a voluntary agency under official government auspices. A central task for the coming year is to create such a structure.

Assuming its formation the functional divisions would include:

- *Geophysical survey*: site surveys, underground water surveys, land use and contour maps.
- *Construction*: dam, tubewells, field levelling and grading, irrigation systems.
- *Water management and conservation*: management of the rotation system, conservation of watersheds and fields, operation of pumps, repair and maintenance of facilities—all in cooperation with village water users associations.
- *Extension*: crop systems, seeds, fertilizers, marketing.
- *Evaluation, monitoring and control*: evaluation of future projects, monitoring past projects, financial and quality inspection and control.

One of the most important ques-

The issue eventually reduces to whether the water is to be allocated to the land or to the people.

tions is the exact relationship between management and conservation and the water users association at the village level. Who is to manage the project, for how long?

This is the question of "top-down" versus "bottom-up" management in rural development. The trend is to blame all past failures on top-down projects and to assume that all future projects involving bottom-up "people's participation" will succeed. Following this model, one would construct the facilities, hand them over to the "village" and move on. But the likelihood is that as one, so to speak, unrolled the rug of rural development ahead it would simultaneously roll up behind. The fact is that there is no "village." There are only individual villagers, living together in a network of cooperative and competitive relationships, in a *political* structure which may or may not function well.

The practical conclusion is that the Sukhomajri organization should hold the reins as loosely as possible, but they should not be dropped. The village water users association will manage the facilities and the rotation system on the basis of authority *delegated from* the water management and conservation division.

This division will have a water inspector who will periodically visit the villages. If things are going well, his visits will become less frequent; if not so well, more frequent. The hope is that in time the water inspector will "just fade away."

The hypothesis is that the best way to establish local control is not directly, by handing it over, but indirectly through delegated authority. The reasons are subtle but important:

- Delegated authority maintains a psychological barrier between "our" property and "their" property. "Our" property, the Indians say, "is nobody's property." There is only "my" property or "your" property.
- It is always easier to resolve conflicts at one level of social interaction by moving the conflict to another level. The water management division of the Sukhomajri organization can thus play an important role as a mediator of local conflicts.
- The presence of an external authority helps the man on the spot. The water users association can say, "*We* would like to help you but those----- will not let us."
- Finally, there is the obvious Big Brother role. If a small, weak farmer has his water stolen by a large, strong farmer (and this is very likely to happen) Big Brother can shut off the larger farmer's water.

In the end, the limit to the Sukhomajri program will not be resources or people or technology, but organization and management. The best managers—and there are many—cannot function in an improperly designed organization. The urgent task is to find a workable structure. Then the projects will fall into place.

Postscript March 1981:

- Three new reservoirs have been constructed in Nada village about 15 kilometers from Sukhomajri. One of the hamlets of this village is occupied exclusively by Harijans untouchables. They were provided with their own reservoir to irrigate their own lands. The response of these oppressed people has been remarkable. They have leveled their land, purchased improved seeds and fertilizers and now have a wheat crop that will compare favorably with the best in India. These villagers have also adopted rope-making as a cottage industry and are busy improving their *chulas* (kitchen stoves) to eliminate smoke and improve thermal efficiency. Much of the development has been through the women, who do most of the village work, while the men work outside. This women's program has been a major element in the success of the Harijan village program.
- The water users association is now established and managing the project at Sukhomajri.
- The "water to the people" philosophy has been extended even to landless villagers. Each *bona fide* family in the village—any group eating from a common hearth in Indian culture— is given a water coupon entitling them to the same quantity of water as any other family, irrespective of land ownership. The family can trade, give away, or sell the coupons as they wish, but with the approval of the Water Users Association. For example, one of the larger farmers has two small farmers working part of his land. They provide the labor and water, he provides the land and they divide the crop equally. Even the large land owners see that the coupon system is necessary to avoid the village tensions that would otherwise ensue.
- The United States Agency for International Development plans to grant $5 million for extension of the Sukhomajri program to 150 villages. The Indian government will contribute at least $1.25 million—possibly as much as $7 million—more to support further expansion to about 400 villages over the next five years.
- The implementing agency for this expansion will be the Bharatiya Agro-Industries Foundation of Poona, Maharashtra—one of the largest and most effective voluntary agencies in India. Under the leadership of Manihhai Desai, a former secretary to Mahatma Gandi, the Foundation has a professional staff of 700 who work in over 7,000 villages, mainly in dairy development programs. This organization has also been a leader in developing and disseminating Leucaena, or *Koobabul*, the "miracle tree" in India. Thus, under Foundation auspices, Sukhomajri will become a truly integrated program, with trees in the watershed for fuel and fodder production, dairy development and, above all, irrigation. ☐

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Westview Press
280 pages, $26.25, paper $12.00

While many Western nations are plagued by terrorism, the United States has largely escaped. True, we have had more than our share of attempts—some successful—on the lives of U.S. political leaders. Yet as far as it is possible to know, our American assassins and would-be assassins seem to act alone. They do not appear to try seriously to advance political programs with their marksmanship; a peculiar form of self-aggrandizement is the more usual motive.

Our genuine terrorists are a motley and largely ineffectual lot: the FALN; Omega 7; the now defunct Weathermen, Minutemen and the tiny group that called itself the Symbionese Liberation Army; a few Croatian nationalists; a couple of home-grown Nazis and a larger number of Klansmen; some followers of Meir Kahane in or out of the Jewish Defense League. They have killed a few people, injured others, destroyed some property and gotten many of their own number killed—but they have failed in their efforts to shape American culture and politics.

The ideological diversity of American terrorists, their ineptitude and their small number would seem to make their activities a matter of relatively minor concern to high government officials. U.S. law enforcement agencies cope with such terrorism as we have, and officials with broad policy responsibilities have not had to pay much attention to the problem. At least that is the way it was until Alexander Haig took office as Secretary of State. He charges that the Soviet Union sponsors international terrorism which he portrays as a major threat to the security of the United States.

Secretary Haig's responsibilities extend beyond the borders of the United States, of course. However great the danger of terrorism within the country, it is undeniably a serious problem in many nations with which the United States maintains friendly relations, and one can imagine ways in which its incidence could shape the way the Secretary carries out his duties. Even so, it is not yet clear what consequences Haig's concerns about terrorism will have for American foreign policy.

Such signals as can be detected are confusing. We have broken off normal relations with Libya because it is regarded as a sponsor of international terrorism. We have also resumed normal relations with Chile even though it is the only other government determined by American courts to have sponsored terrorism in the United States. As for relations with the Soviet Union, they seem wholly unaffected by the charge that it is the real force behind international terrorism. The United States has lifted the grain embargo imposed by President Carter when the Soviet Union invaded Afghanistan, even though Soviet forces continue to occupy Afghanistan. Yet this country is engaged in a military build-up to counter what is regarded as the threat of Soviet military power and expansionist ambitions. While these actions go in opposite directions, neither they —nor any other of Haig's foreign policy initiatives—seem relevant to presumed Soviet sponsorship of international terrorism.

Alexander Haig is not the only person recently installed in high government office who is preoccupied with terrorism. Another prominent official to express similar concerns as loudly and frequently is Jeremiah Denton, Senator from Alabama and chairman of a Senate subcommittee that has started to hold hearings on terrorism. Denton shares Haig's view that international terrorism is a Soviet plot, but his program for dealing with the problem is less obscure. Responding to a question from William F. Buckley on a television show on which I also appeared, Denton proposed to start by amending or abolishing the federal Freedom of Information and Privacy Acts. As the Senator sees it these laws permit terrorists and potential terrorists to hamstring agencies like the CIA and FBI by discovering what they are doing. Denton has also suggested that some persons and organizations that have sought controls on the activities of the intelligence agencies, ostensibly on civil liberties grounds, are actually motivated by an interest in aiding a Soviet plot to bring down the West by terrorism. This has aroused concern in some quarters that the anti-terrorist campaign of Haig, Denton and com-

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pany will be the vehicle for a rebirth of McCarthyism.

Of several recent books on terrorism, Claire Sterling's *The Terror Network* has attracted the most attention because its publication coincided with Alexander Haig's public pronouncements and because Sterling espouses more or less the same view. According to advertisements for the book, what Haig charges Sterling proves. As I have explained in "A Sterling Vapor Gun" (*The Nation*, May 9, 1981), she does not. Yet *The Terror Network*, which substitutes innuendo for evidence, has been eagerly seized upon by those who want to believe Haig's charges. Sterling was a star witness on the opening day of Senator Denton's hearings.

One circumstance from which Sterling infers a Soviet plot is that during the 1970s, when international terrorism reached its apogee, "Not a terrorist shot had been fired for freedom within the Soviet orbit." Walter Laqueur has a less conspiratorial explanation:

> "Terrorism, notwithstanding the report about what allegedly happened in Moscow's underground [an unconfirmed rumor has it that six people were killed when a bomb exploded in the Moscow subway in 1977] does not occur in totalitarian societies. It does not even occur in moderately effective military dictatorships. Terrorism today occurs either in Parliamentary democracies, or in half-hearted, inefficient authoritarian regimes. In the 19th century, terrorism was mainly concentrated in despotic regimes, today terrorism occurs mainly in democratic societies. In a totalitarian regime, terrorist actions would not be reported. But terrorist action by itself is nothing; what makes it significant is that it is shown on television and featured in the press. Unless there is this propaganda impact, terrorism is just not effective."

This passage appears in an essay collection, *Ten Years of Terrorism*. Looking over my notes on the several books discussed here, I find that there were more useful insights in that essay and a few others in the RUSI volume—notably the contributions by Richard Clutterbuck and John Terraine—than in the rest of these books combined.

The question of whether a bomb killing six people actually exploded in the Moscow subway, of course, makes Laqueur's point. Given the nature of the Soviet Union, we do not know and cannot find out if this really happened. If it did, we do not know and cannot discover who was responsible, whether the person or group was trying to make a political point, or what that point might be. Only those who learned of the event by word-of-mouth may have been terrorized. And even among them, no political advantage could have been gained unless the ideology of the bombers was made known or their cause identified. Under such circumstances, why would anyone go to the considerable trouble and risk of planting a bomb?

As Laqueur points out, nineteenth century terrorism occurred mainly in despotic regimes. Such regimes were not as efficient as contemporary totalitarian states in limiting the dissemination of information. A central purpose of the terrorists of the era was to encourage the populace to revolt by demonstrating the vulnerability of despots. The message of terrorism, Nikolai Morozov wrote in 1880, is: "Do not be afraid of the Tsar, do not be afraid of despotic rulers because all of them are weak and helpless against secret, sudden assassinations." Morozov got to prove his point. In 1881, the terrorist organization with which he was associated, *Narodnaya Volya*, succeeded in assassinating Tsar Alexander II, an event that encouraged the revolutionary movement.

To a diminished extent, demonstrating the vulnerability of those perceived as despots remains a purpose of present-day terrorism. This is not a useful approach to the contemporary bureaucratic totalitarian state, however. Assassinating Leonid Brezhnev, for example, would not expose vulnerability in the Soviet system. Only Fidel Castro, of the heads of governments aligned with the Soviet Union, exercises the kind of personal leadership that suggests that assassinating him would make a difference. Perhaps that is why Castro's assassination was plotted for so long by the CIA. Assassinating the leaders of other Soviet bloc governments would probably demonstrate only the imperviousness of the system to terrorist violence. An equally colorless leader would quickly be put in place and the machine of state would probably not skip a beat.

The question of what message terrorism is intended to convey seems essential to an understanding of the phenomenon. That is because terrorism, as it is sometimes defined, is violence designed to cause a reaction disproportionate to the physical harm it produces. The reaction, which determines success or failure, may take many forms. In addition to encouraging revolutionary activity by exposing vulnerability, reactions that may be sought by terrorists include increased awareness of their cause; identification of themselves as the leaders of that segment of the population that supports their cause; fear that more violence will occur unless concessions are made to them; and disproportionate measures by the authorities to suppress terrorism. It is the hope of evoking this last that seems to be the primary purpose of most contemporary terrorists. Their aim, as several terrorist theorists have pointed out, is to make the authorities discredit themselves and, thereby, to gain adherents for the cause espoused by the terrorists. The deep antagonism against the British felt by the Catholic population of Northern Ireland reflects the success of the Irish Republican Army in making Britain discredit itself (as in the treatment of prisoners) by its reaction to terror. Similarly, pan-Arab support for the Palestine Liberation Organization reflects its success in provoking Israel to discredit itself (as in the bombing of Beirut) by its reaction to terror.

All of the books considered here deal with the question of what to do about terrorism. For the most part, however, the solutions that are proposed seem to have been derived with little thought about the reactions that terrorists hope to provoke. Irving Louis Horowitz, in *Taking Lives*, says that we must strengthen "the social fabric as a whole and the economic order specifically." He goes on to caution us that "strength cannot be reduced to a code word for increased surveillance; it clearly entails real changes in the social system, including new weightings in the distribution of wealth, power and status." Ernest Evans, in *Calling a Truce to Terror*, calls for "a strategy of delegitimization." He recognizes that reprisals and retaliatory raids can be costly politically and, indeed delegitimize the state conducting them. His solution to this problem is multilateral agreements by nations to take common action against terrorists.

Augustus R. Norton and Martin Greenberg's *Studies in Nuclear Terrorism* has a long list of proposals for dealing with terrorism, suggested by the contributors to this book. Forrest Frank, for example, proposes restricting "the worldwide supply of material from which a fission nuclear explosive device could be fashioned"; an international treaty providing "no safe havens" for nuclear terrorists; and "international discussions on ways to minimize the escalation of conflict arising from nuclear terrorism." Louis René Beres proposes more infiltration of terrorist groups and other efforts to disrupt them. Robert Kupperman proposes a "crisis management team"; constant "remotely accessible data bases concerning terrorist groups"; "no safe havens" international agreements; "specialized paramilitary" rescue squads; and funding for "a vigorous research and development program" which, he suggests, is the most important solution to terrorism.

In *Terrorism: Theory and Practice*, in his essay on "Coping with Terrorism," Robert A. Friedlander, proposes that terrorists must be declared "outlaws before the world." He is dubious about multilateral conventions because the signatory states might not enforce them but favors punitive sanctions against countries providing refuge for terrorists. He also discusses the suspension of civil liberties as a way of combatting terrorism but neither endorses nor rejects this approach. A hint about where he might come out is provided in his concluding paragraphs:

> "The challenge of terrorism is fundamentally a challenge of the will. If there is to be a test of strength between those who initiate terrorist violence and those who oppose it, then that challenge can only be met by the exercise of power which, in turn, is derived from a legal-political structure designed for regulation and not for reformation."
>
> "The debate over whether it is really possible to give a civilized response to an uncivilized act has yet to be resolved. The issue is one of global survival and its outcome affects us all."

In *Ten Years of Terrorism*, there is a chapter on "The Response to Terrorism" by Peter Janke, while several military and police officials add brief comments on "Terrorism and Security Force Requirements." These are the least interesting contributions, wholly predictable in their discussion of computerized files, special commando groups and the like. The proposals for coping with terrorism are not particularly foolish, but neither do they seem very perceptive. The same might be said for the solutions proposed in all of these books.

In the case of *Ten Years of Terrorism*, however, the pedestrian quality of the essays that deal with the response to terrorism is the more disappointing because other essays in the book lead a reader to expect more. The essay that I would like to have found in it would deal with how to prevent the terrorists from eliciting the reactions they seek. It would start by acknowledging that, except in well-established totalitarian societies, it is impossible to prevent terrorists from making terror an instrument for promoting awareness of their cause. There are too many causes in the world for us to be aware of them all and it is only natural, therefore, that we should pay disproportionate attention to those that figure in sensational episodes. Also, the nature of contemporary communications makes the visual drama of terrorism a perfect subject for attention. But if securing awareness must be conceded to terrorists, the other reactions that they seek are not foreordained. I would have especially welcomed a discussion of whether a government might steer a course between demonstrating vulnerability on the one hand and taking disproportionate self-discrediting measures on the other.

Despite its shortcomings, the RUSI book is well worth reading. As for the rest of these books, I would give them a pass. ☐

JUNE TEUFEL DREYER reviews

Asian Security in the 1980s: Problems and Policies for a Time of Transition
edited by Richard H. Solomon
Oelgeschlager
336 pages, $20.00

In the years since World War II, East Asia has experienced rapid economic growth and sharp political changes, both within individual countries and in these countries' international interactions. It has in addition been the site of several military conflicts with important ramifications for the global balance of power. Yet, in the opinion of many observers, the United States pays too little attention to Asia, focusing disproportionately on the Soviet Union and Western Europe. During the last half of the 1970s, this concern heightened: in the wake of its defeat in Indochina, the United States appeared to lose interest in Asia, even announcing that it planned to withdraw American troops from South Korea. Critics accused the United States of misplaced priorities, fearing a new period of isolation.

Concern about America's intentions in Asia prompted the RAND Corporation to convene a conference designed to clarify U.S. options. Held in January 1979, it included representatives of major noncommunist East Asian states as well as U.S. government analysts and officials. Among the topics treated in papers and discussion groups were the implications of Soviet military presence in Asia, the growing Japanese public defense consciousness, the influence of the Association of Southeast Asian Nations on regional security, and the stake of outside powers in Korea.

While the participants were in general agreement that the paramount factor shaping the security of Asia in the 1980s would be the impact of Sino-Soviet rivalry on the region, and favored a continuing U.S. commitment to the defense of Asia, there were few specific areas of agreement. Moreover, as is often the case with the wisest predictions of the wisest analysts, events have proven otherwise. One delegate's very reasonable contention that Vietnam would be deterred from invading Kampuchea for fear of damaging its standing in the Third World, Japan, and the West was quickly proven wrong. And views in favor of the United States maintaining equidistance between the Soviet Union and China, while not selling arms to the People's Republic have been ignored in Washington. Park Chung-hee's assassination could not have been predicted, nor could the relatively smooth manner in which his successor took charge.

Nonetheless, there is much in this volume worth pondering. The United States and its allies should indeed, as one participant suggested, develop policies to deal in a preventive manner with anticipated leader succession crises in such countries as the Philippines and Indonesia, and with the potential for ethnic and communal violence, especially between Muslim and Chinese communities in these and several other states. We should also endeavor to manage the economic tensions associated with Asia's rapid development, including market protectionism, trade imbalances, access to raw materials and food supplies, and to investment capital, so as to minimize the potential for disruption that could spill over to affect political and security relationships. As pointed out in the book's conclusions, how the United States and its allies manage these and related issues will determine whether Asia in the coming decade will become polarized around the Sino-Soviet conflict, or whether a regional balance of forces will grow around America's traditional alliance relationships. ☐

"AN EXTRAORDINARY EXPERIMENT in historiography...a portrait of German physics in the first decades of this century...based on impeccable and wide-ranging scholarship."
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McCormmach's creation, Victor Jakob, is a sad and aging German physicist. The rich detail of his daily life, and the ideas such a man might have had...are composed into a moving and effective portrait."
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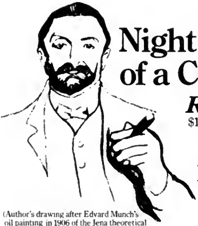

(Author's drawing after Edvard Munch's oil painting in 1906 of the Jena theoretical physicist Felix Auerbach.)

Night Thoughts of a Classical Physicist
Russell McCormmach
$15.00

Available at your local bookstore or directly from
Harvard University Press
79 Garden Street
Cambridge, Massachusetts 02138

Films

ELLEN HACKETT and JOHN DOWLING review

The Race Nobody Wins

Produced and directed by David Cartwright. Distributed by SANE, 514 C St., NE, Washington, D.C. 20002. Audiocassette and filmstrip, 15 min., 1981. $45 purchase ($20 for educators), $10 rental.

This filmstrip and sound presentation serves as a general introduction to the arms race. *The Race Nobody Wins* presents a clear, simple outline of many of the main issues involved and describes what can be done to halt the arms race. The topics covered include the buildup of new weapons (submarines, war planes, tanks), the MX and cruise missiles, and the spread of nuclear weapons. It discusses negotiations to slow the arms race: SALT, the Nuclear Test Ban Treaty, and treaties which bar weapons in Antarctica, outer space, the seabed and Latin America. It also points out that such problems as poverty, crime and pollution are increasing with, paradoxically, an increase in the military budget and a corresponding decrease in social, environmental, medical and educational programs.

Although *The Race Nobody Wins* provides minimal factual information, it does discuss some of the alternatives to the arms race: economic conversion and the effect of increased military production on the economy, arms control negotiations, and nuclear disarmament. While arms controllers will not learn much new information from this program, it should be of great benefit for presentations which seek public support for halting the arms race. *The Race Nobody Wins* is interesting, current and polished. It will be of use in informing the public about the current status of the arms race. ☐

JOHN DOWLING reviews

Eight Minutes to Midnight: A Portrait of Dr. Helen Caldicott

Produced by Mary Benjamin. 16mm., color, 60 min., 1981. $800 purchase from Direct Cinema Ltd., P.O. Box 69589, Los Angeles, Calif. 90069. $150 (general), $100 (college), $75 (high school) rental from Caldicott Project, Direct Cinema Ltd. Library, P.O. Box 315, Franklin Lakes, New Jersey 07417.

Helen Caldicott sees nuclear power as "the pimple on the pumpkin," the pumpkin being the nuclear arms race. And as this film well attests, she is speaking effectively and directly to the real heart of the matter: "The world is hooked on nuclear power like a drug . . . I can't tolerate the fact we might destroy it all."; "I view nuclear weapons and nuclear power as the greatest health hazard the world has ever known."; and "We're killing ourselves to make the bombs to kill ourselves better."

Eight Minutes to Midnight documents Helen Caldicott's struggle to arouse and inform the public about nuclear power and the arms race. The film opens with her speaking to a group of Boston-area doctors on the nuclear issues. It proceeds to a TV talk show where she is promoting her book *Nuclear Madness: What You Can Do*, and accompanies her on speaking engagements to Australia, Harrisburg, Colorado, New Mexico and the Washington rally of May, 1979. The film also intermixes sketches of her life as pediatrician, author, spokesperson, and so forth.

But what comes across strongly in the film is Caldicott's articulation, drive, intelligence, and her sense of values. Occasionally, she makes a too broad or a too sweeping statement. Caldicott's performance is impressive in her grasp of the problems, her charisma, and her dedication.

The final moments of the film deal with her work as president of "Physicians for Social Responsibility" (a group of doctors striving to interject the important medical arguments against nuclear holocaust into the arms race debate). Caldicott is speaking to a group of medical personnel, and a member of the audience, obviously depressed at the very negative picture of the status quo, asks her, "What are your grounds for hope and to what extent are they rational?" Caldicott momentarily searches for an answer and comes up with, "I'll be damned if I let those bastards kill us all!" The scene closes with her saying, "This is the most important issue ever, ever to face the human race . . . you must take the world on your shoulders like Atlas and make a total commitment. You inherited the earth—it is your birthright."

The film conveys some hope in today's otherwise bleak atmosphere, based not on any breakthrough in arms control, but on the fact that a dedicated person can make a difference in slowing the arms race. The *Eight Minutes to Midnight* refers to the time left to the human race. If we are to live beyond the eight minutes, it will be because people like Helen Caldicott have made "a total commitment" to move people to act. ☐

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NORMAN DOMBEY

International agreements on nuclear weapons

Two events in the past two years have drawn special attention to the unsatisfactory nature of the present international agreements on nuclear weapons and of their monitoring and enforcement. The purpose of this note is to emphasize that unless arrangements can be made quickly to strengthen these agreements and especially their monitoring and enforcement, then it may be too late to redress the situation in view of the increasing number of states who have or will shortly have access to nuclear weapon materials, highly enriched (that is, over 90 percent) uranium and plutonium. This access is through possession of specialized reactors used in nuclear power or research programs which burn such weapon-grade fuels and through technological advances which promise to make enrichment and reprocessing facilities more widespread.

The two events are:

- the detection by a Vela satellite on Sept. 22, 1979 of a double flash of light, characteristic of a nuclear explosion somewhere in the south Atlantic;
- the Israeli destruction of Iraq's new large Osirak research reactor.

In each case the governments accused of testing or intending to make a nuclear weapon—South Africa and Iraq respectively—have denied the accusations and have pointed out that they are bound by international agreement—the 1963 Test Ban Treaty in the case of South Africa and the 1968 Non-Proliferation Treaty in the case of Iraq—not to do what they have been accused of doing. In each case the government or international agency responsible for monitoring these agreements—the U.S. government which established its program of Vela satellites for the purpose of detecting any atmospheric nuclear tests in violation of the Test Ban Treaty, and the International Atomic Energy Agency (IAEA) in the case of the Non-Proliferation Treaty—have agreed with the governments accused and have stated that there was no reliable evidence from which any conclusion could be drawn that the relevant international agreement had been broken. Nevertheless, in both cases any unfriendly state would view what evidence there was with concern and would naturally take a worst case view of the facts. So without access to military or other intelligence and relying solely on published material, and with no knowledge whatever of the intentions or capabilities of South Africa or Iraq in this area, I will summarize from a physicist's point of view the worst case scenario in each case.

Case 1. A nuclear explosion produces in less than one-thousandth of a second a fireball of extremely high temperature (about one million degrees) which rapidly expands, forming a shock wave between itself and the surrounding air. This shock surface is opaque to visible light until the fireball has expanded and cooled sufficiently to allow light to pass through. Thus a detector measures a flash of light at very short times before the shock surface has formed, followed by another flash containing most of the energy at times of order one-tenth of a second coming from the fireball now that the surface is transparent to visible light. The curve (see figure) showing the detected signal strength versus time on a logarithmic scale is therefore characteristic of a nuclear explosion; from the position of the minimum and second maximum the strength of the explosion can be determined.

Guy E. Barash from Los Alamos, the laboratory which is involved in the Vela program, has written a short review on detection of atmospheric nuclear explosions from which the figure is taken. He states in his review that "naturally occurring signals would not be mistaken for that of a nuclear explosion" and that "the nuclear signature is orders of magnitude more energetic than any other terrestrial phenomenon that might simulate it."[1] A Vela satellite, undoubtedly picked up a signal characteristic of a 2 to 3 kiloton nuclear explosion on Sept. 22, 1979.[2,3]

Coincident signals not unique to nuclear explosions but characteristic of such explosions were also detected by the radio telescope at Arecibo in Puerto Rico and by the U.S. Navy through its sonar equipment.[2,3]

No radioactive materials were detected subsequently but this is consistent with what is expected if a small nuclear weapon is exploded off the ground in a remote area of high rainfall.[4]

Although South Africa's nuclear power program (which involves reactors supplied by France) is not yet in operation, there is a research reactor, Safari 1, which has been in operation since 1965 and which burns highly enriched uranium. Over 100 kilograms of this fuel have been supplied by the United States.

South Africa has access to uranium ore as a by-product of gold mining in its own territory, and from the Rossing project in Namibia which is being developed with substantial British, French and U.S. involvement.[5]

South Africa has had a small pilot enrichment plant operating since 1975[6] which in four years could have produced over 100 kilograms of high enriched uranium. The enrichment process is a variation of the jet nozzle technique developed in Karlsruhe, and a good deal of West German help is reported to have gone into this venture.[7]

Case 2. Osirak, like Safari 1, was to burn highly enriched uranium, and an initial load of 12 kilograms had already been delivered to Iraq from France. A further 58 kilograms was on its way to Iraq.[8]

France had offered "caramel" fuel to Iraq in place of the highly enriched fuel but this had been refused.[8] "Caramel" fuel is a low enriched (about 7 percent enrichment—too low for weapon production) fuel recently developed by CEA (the French Atomic Energy Authority) for use in research reactors such as Osirak.

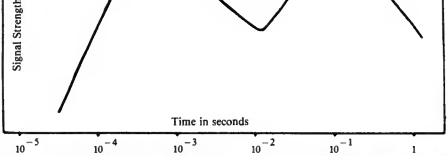
Iraq had bought a hot cell from Italy which enables it to treat highly radioactive materials irradiated in the reactor by remote handling.[8,9]

Iraq had bought 138 tons of yellowcake (the mineral from which uranium metal is extracted).

Iraq had signed a nuclear cooperation agreement with Brazil, which in turn had an agreement with West Germany for the eventual supply of complete fuel cycle facilities including a reprocessing plant.[9]

A consignment of low-enriched uranium fuel rods was refused permission for shipment to West Germany from the United States when it was discovered that the final designation was to be Iraq.[9]

So the worst case scenario is clear in each case. In Case 1 South Africa—the nearest state to the explosion with access to weapons material obtained either by diversion of fuel destined for Safari 1 or from its own mines and enrichment plant—had tested a small nuclear weapon which was detected (unfortunately for them) by a Vela satellite even though the Vela system was planned to give total coverage only to the Northern hemisphere. The size of the weapon at 2 to 3 kilotons shows that it is sophisticated; at Hiroshima the yield was 20 kilotons, and the size of the first weapons exploded by the other nuclear powers has also roughly been of this magnitude. A much more complex device is called for if the yield is to be limited; hence the need for a test to see if everything works. A small fission bomb of 2 to 3 kilotons would appeal to the military of many countries for use as a battlefield anti-tank weapon for the same sort of reason given by the proponents of the neutron bomb within NATO.



The curve, characteristic of a nuclear explosion, shows the detected signal strength in relation to time on a logarithmic scale.

In Case 2 the Osirak reactor does not generate electricity and it is too large to be used simply for university research; it is a specialized reactor of a type used for materials testing and for isotope production on a semi-industrial scale. Iraq, however, is not widely known for its interest and expertise in these fields. The caramel fuel, although of slightly lower performance than the high enriched fuel, would presumably have been adequate for any test of materials or for the production of any isotope the reactor staff had in mind. As the caramel fuel was refused, it follows that Iraq had uses in mind for the high enriched fuel other than materials testing or isotope production. Even if the high enriched fuel had been irradiated by France before it had been dispatched, the enriched uranium could have been recovered using the hot cell. An alternative back-up strategy could have been envisaged of irradiating natural uranium (as Iraq was not able to obtain the made-up low-enriched fuel rods from the United States) in the large space in the core of the reactor provided especially to facilitate isotope production, thereby indeed producing an isotope, namely plutonium 239. This could then be separated using the hot cell, or eventually using the proper reprocessing facilities to which Iraq hoped to have access through its agreement with Brazil.

The plots can also thicken: South Africa could be in league with Israel[10] with which it has military links[3,11] who could have supplied plutonium from their Dimona reactor; and the weapon

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tested could have been in the form of a ready-made 155 millimeter shell, conventional versions of which the South Africans are known to possess.[3,12] Similarly Iraq could be planning an Islamic bomb[13] with Palestinian scientists working on the project[14] and help from Pakistan which is planning its own enrichment facility and has many competent nuclear scientists.[15]

Thus, in spite of protestations of the monitoring bodies that "there is no persuasive evidence to corroborate the occurrence of a nuclear explosion on 22nd September"[16] in the first case and that "the International Atomic Energy Agency has inspected the Iraqi reactor and has not found evidence of any activity not in accordance with the non-proliferation treaty"[17] in the second, any state which is unfriendly will naturally take the worst case scenario as the basis for action, as Israel had already demonstrated in Case 2, and as the African states have concluded in Case 1.[18] So what Ian Smart called "the element of fear" will predominate. He states "with non-proliferation, it is the fear that however innocent in the present, independent national access to sensitive material or technology, even under safeguards, might be swifty exploited in the future to produce weapons.[19] From these examples my initial statement follows: the present international agreements are unsatisfactory and need strengthening as a matter of urgency.

My own view is that although the situation is urgent, it is not yet too late for an international effort to strengthen the non-proliferation agreements. This is because the other aspect of any non-proliferation agreement is security in nuclear energy affairs: security of supply of the materials and technology needed in a civil nuclear power program, especially for energy-poor states on the one hand, and a secure market for the suppliers of nuclear technology on the other. Much has been written during and following the International Nuclear Fuel Cycle Evaluation (INFCE) discussions on possible international and multinational frameworks to cover both non-proliferation and secure nuclear supplies/markets.[19]

What does seem to me to be favorable at the present time is that a converging view has been forming over the past year both in the United States, which, since President Ford, has officially looked with disfavor on reprocessing, and in France and Britain which plan to expand their reprocessing facilities, but need international acceptance of these facilities in order to be able to sign meaningful contracts. Thus Abram Chayes, the American chairman of the Technical Coordinating Committee of INFCE said just over a year ago that "if we want a regime governing the terms and conditions of international access to nuclear fuel, facilities and technology, it will have to be a regime that is internationally formulated and has the concurrence of all major affected interests. The day when the United States or any other country could impose its will on these matters is over."[20] He went on to call for an "International Plutonium Storage and Management System." Whereas Bertrand Goldschmidt, who has played a major role in the French nuclear program since its inception, has stated that "The work of the INFCE did nevertheless underline the advantage, recognised for sometime now, of the internationalization of sensitive plants, and particularly of plutonium stocks, together with the desirability of supplying research reactors only with a uranium containing less than 20 percent uranium 235.[21] What seems to me to be particularly encouraging is that France and the United States, the two countries which have for many years taken the most diametrically opposed views on this question, now seem as if they may be in sight of agreement.

If we can learn anything from the two examples quoted earlier, it is first that nuclear technology is a multinational activity and that it would be very hard for any country, apart from the superpowers, to rely on its own resources. The United States, Britain, France and West Germany appear in the first scenario and France, West Germany, Italy, Portugal and Brazil appear in the second. Herein lies the strength of any multinational agreement as it could be used to deny nuclear supplies to transgressors. Secondly, both examples above involve the possibility of using high enriched uranium as well as plutonium for weapons, an option which has not attracted enough attention in the past. Goldschmidt[21] directs special attention to this point and says "ultra-centrifugation lends itself much more easily, and on a much reduced scale, to the production of heavy enrichment than does gaseous diffusion. The same will apply, though no doubt on an even more frightening level, on the day when the method of separation by laser becomes fully developed."[22] There have been recent advances[23] in laser-separation, and clearly this must mean that any strengthened agreement must aim to cover not only technology but the supply of uranium itself.

The situation is urgent, perhaps even desperate, but there is some light on the horizon. The views of the suppliers of nuclear technology now seem to be converging. The majority of countries which are actual or potential consumers of nuclear power need assurances that their civil program will not be misconstrued as military in intent and that commercial contracts will be honored. It is to be hoped, therefore, that the new Committee on Assured Supply at the IAEA which does include "all major affected interests" can be prodded into action. ☐

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On IAEA safeguards

Sidney Moglewer (*Bulletin*, Oct. 1981) is harshly critical of International Atomic Energy Agency safeguards because he claims that the system suffers by comparison with the U.S. Nuclear Regulatory Commission system of material accounting. He refers to the Agency as a regulator, with conflicting responsibilities as a promotional agency, and he faults it for, among other things, failure to concern itself with the terrorist threat. His criticisms, if accepted at face value, would have the effect of seriously undermining confidence in the entire system of international safeguards. Moglewer joins an increasing chorus of Agency critics; if they are wrong, it is important to the preservation of the nonproliferation control structure that those criticisms be answered.

Moglewer's views are based on a fundamental misconception of the purposes and functions of the Agency's safeguards—misconceptions shared by too many policymakers, and inadvertently spread on occasion by the Agency itself.

First, let us dispose of some of Moglewer's more clearcut misconceptions. He attributes the alleged deficiencies of Agency safeguards to a conflict between its regulatory and promotional responsibilities. That particular criticism became fashionable a few years ago, when it was directed, with considerable justification, at the U.S. Atomic Energy Commission.

Unlike the Commission, the Agency is neither a regulator nor a promoter. It has no legal authority to impose regulations or to enforce them; that authority is held by the state having jurisdiction. The Agency's safeguards activities are monitoring and auditing, not regulation; and they are subject to voluntary agreements with individual states, negotiated under general, common guidelines. The Agency's other principal function is to provide technical assistance to members in the application of nuclear energy, fulfilling commitments made by advanced-country members and reaffirmed under the Non-Proliferation Treaty. Nothing in either the Agency Statute nor the Treaty indicates that the Agency's responsibility is to "sell" nuclear energy rather than to make technical assistance available when it is asked for. Unlike the potential conflict between regulation and promotion, there is no basis for the charges that the Agency is deliberately lax in carrying out its safeguards responsibilities in order to extend the use of nuclear power. Such charges should be supported by something more substantive than incorrect interpretations of Agency functions and assertions that the "collegial environment" of the Agency is unhealthy.

Moglewer implies that the Agency shows inadequate concern for theft by terrorists. He seems not to understand that the state is responsible for measures to prevent theft by individuals. Throughout, he compares Agency with Nuclear Regulatory Commission (NRC) safeguards. But the system is not a counterpart of the Commission. What are generally referred to as IAEA safeguards are a supranational operational element in a comprehensive system, of which national elements are integral parts. The Agency system provides guidelines for national systems of physical protection and material control. The operational function of "IAEA safeguards" is to audit national records, analyze reported data, and verify records and reports by means of independent measurements and observations. Protection against subnational adversaries and individuals rests with the sovereign authority of the nation, not the Agency.

One of Moglewer's major criticisms centers on the contention that the "timeliness criteria" are not met. The idea that Agency safeguards are ineffective if a diversion cannot be detected and action taken to prevent assembly into a bomb before the material can be converted to bomb-usable forms has been reiterated for so long by nuclear critics that it has been accepted by many as a requirement. The term "timely detection," quoted from the Agency document, has been used by the Agency only to indicate that detection time should be roughly related, *by order of magnitude*, to conversion time; that timeliness is a more important factor, for example, for separated plutonium than for natural uranium.

Timely warning in the sense used by Moglewer has never been recognized by the Agency as a criterion for acceptable performance. The rationale for the necessity of successful intervention before a single bomb could be assembled is more appropriate where subnational theft is a concern than where the purpose is to monitor compliance with international agreements. Agency safeguards include no control or retaliatory means, and it is not credible that responsible action of any kind would be taken within a few days, even with instantaneous detection. If "timely detection" in that sense is a necessary criterion, then no system of materials accounting could meet it: not IAEA, not Euratom, and not the Commission. Such an interpretation arose from confusion between physical protection against terrorists and the monitoring of peaceful uses. Only the latter is the function of Agency safeguards.

The Agency position has been:

> "According to recommendations of highly qualified advisers detection time should be of the order of magnitude of conversion time. Critics stress again that the philosophy of physical protection may have suggested—at least partially—this definition. The physical protection reasoning assumes that detection should be so timely that the diverted material can be recovered before the diverter was able to insert it into a previously prepared explosive device. At the national level such quick action of guards or police against individuals or groups is both necessary and possible. At the international level we have to take into account both the reaction time of political organs and the restricted scope of their sanctions."*

David Fischer, in the paper cited by Moglewer, says that safeguards are not a burglar alarm but a means of providing assurance. Moglewer saw that statement only as evidence that Fischer does not understand the null hypothesis of statistical analysis. Moglewer would have a clearer understanding of safeguards and the problem of proliferation control in general if he would read Fischer's paper with a broader perspective.

Moglewer also finds fault with material-balance accounting as a basis for safeguards, pointing out the problems of measurement error, unmeasured sidestreams and residual uncertainties. But he suggests no solutions, thus implying that analysis of "materials unaccounted for" is at best ineffective and at worst misleading. What would he suggest as an alternative? Fissile materials are obviously essential to weapons-related activities, and verification that all those materials are accounted for is probably the best means of assurance that agreements limiting them to peaceful uses are complied with. It does not follow, however, that because detection capability may be limited at a quantitative threshold of a few kilograms, that material-balance accounting is ineffective.

Rather than set some hypothetical standard for acceptable safeguards in terms of detection performance, which as Moglewer mentions is difficult for the Commission as well to meet, Agency safeguards should be judged in terms more analogous to arms control. Monitoring of compliance by means of on-site inspection is at a primitive stage of development. Safeguards, whatever their technical limitations, are a major advance in international cooperation and confidence. If Moglewer is critical of safeguards because they might not detect diversion of small quantities, what does he expect of systems for monitoring arms-control agreements? If the effort is useless, or worse, what does he advocate?

Because the Agency's safeguards have not met unrealistic expectations of detection performance, many have concluded that Atoms for Peace was a mistake. The corollary is that, if we had continued the previous restrictive policy of secrecy, we could have held nuclear technology within Pandora's box. That naive view ignores the fact that the box was always leaky (the British, Soviet, and French nuclear programs were begun in that era), and it is based on the arrogant assumption that other peoples are not capable of developing their own technology. There was never any escape by unilateral action from the potential dangers of nuclear energy, and there is none now.

Support for the Agency is based on a balance between desire for access to nuclear energy and concern over the potential for weapons use. Safeguards are essential to maintaining that balance. Some countries accept safeguards as a *quid pro quo* for nuclear assistance; others consider them a necessary condition for advancing such assistance. The Non-Proliferation Treaty and the Latin-American Treaty likewise are dependent on these safeguards; loss of confidence will cause the whole structure of proliferation control to collapse. The world has progressed far in international cooperation by the acceptance of international safeguards inspection. We must not allow that progress to be jeopardized by unfounded criticism on narrow technical grounds. The safeguards technical community should apply its efforts, instead, to support of technical assistance by the United States, Canada, and others to improve their effectiveness.

---

*Hans Grümm, Deputy Director General, Department of Safeguards, IAEA, in a paper presented at the 21st Annual Meeting of the Institute for Nuclear Materials Management, 1980.

Moglewer seems to think that, in view of what he considers to be fatal weaknesses of Agency safeguards, Lovins, Lovins and Ross offer a suitable fallback alternative. But in the article Moglewer cited, they dismiss the entire problem by proclaiming that the question of nuclear regulation is moot, because when the social revolution that they envision is accomplished, all central power stations will be replaced by such things as backyard biogas generators and windmills.

We do not consider the issue to be moot. We must continue efforts to control the spread of nuclear weapons. The IAEA is not an ineffective police force; rather, it is the most advanced system of international inspection of the internal activities of sovereign states that has ever operated. The purposes of non-proliferation are ill-served if confidence in its safeguards is undermined because they are mistakenly judged.

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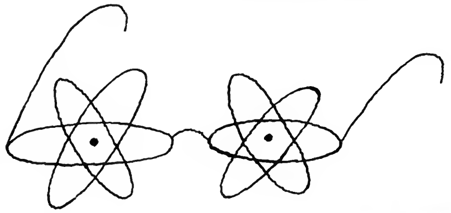

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* * *

Sidney Moglewer quotes me as saying: "In other words, the cardinal object of safeguards is to give assurance of the *absence* of diversion, to give assurance that the safeguarded state is not steadily diverting material for use in an emergency." He then adds: "Fischer is explicity accepting the null hypothesis by this statement."

I was not doing anything of the sort. My intension, which obviously failed, was to make it clear that the main political value of Non-Proliferation Treaty (NPT) safeguards was to provide a reasonable assurance that one's own country was *not* engaged in making nuclear explosives or nuclear weapons, in other words, to demonstrate one's own peaceful commitment and thereby contribute to international security.

The reason I felt it necessary to make this point was that during the late 1970s the main political view of safeguards was widely and, in my view, wrongly held to be that of giving "timely warning" *after* a diversion so that other countries could politically pressure the diverter to dissuade him from detonating the diverted material. This interpretation was very different from that of the architects of the Non-Proliferation Treaty and of the Standard NPT-Safeguards Agreements who emphasized the deterrent effect of safeguards as well as the verification of non-diversion. By the time a diversion takes place (if it ever does), the value of safeguards in providing an international assurance of peaceful commitment and of deterring diversion would obviously have been reduced to zero in the case in question.

It seems that in a recent incident NPT safeguards have failed to provide this assurance to one of the IAEA's member states but this is another question which is dealt with succintly in Anthony Fainberg's article in the same issue.

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* * *

Moglewer's response: To the careful reader the points made in the de Montmollin letter speak for themselves. I quote from the publication *IAEA Safeguards, An Introduction* IAEA/SG/INF/3 (IAEA, Vienna, 1981):

> "Deterrence is aimed at dissuading any state that might contemplate diversion of nuclear materials or the misuse of nuclear facilities. It fol-

lows that, to constitute an effective deterrent, safeguards must be technically capable [and be seen to be capable] of promptly detecting the diversion. Detection of diversion must also be seen to entail effective penalties for the diverting country."

If one accepts de Montmollin's viewpoint, particularly with respect to a timeliness criteria, the Agency itself has unrealistic expectations of detection performance. Responsible professionals, despite affiliation, have an ethical obligation to present their concerns directly, to persuade the organization to change its safeguards objectives to more realistic goals compatible with technical capability.

I certainly agree with the authors that the International Atomic Energy Agency is the most advanced system of international inspection of the internal activities of sovereign states that has ever operated. I also believe that there is serious question of Agency effectiveness. That is the problem.

Fischer presents an interesting interpretation of the meaning of safeguards assurance—"to provide a reasonable assurance that one's own country was *not* engaged in making nuclear explosives or nuclear weapons, . . ." Again I quote from the publication *IAEA Safeguards: An Introduction*:

> "Safeguards are essentially a technical means of verifying the fulfillment of political obligations undertaken by States in concluding international agreements relating to the peaceful uses of nuclear energy.
>
> The main political objectives of safeguards are:
>
> - To assure the international community that States are complying with their non-proliferation and other 'peaceful use' undertakings;
> - To deter (a) the diversion of safeguarded nuclear materials to the production of nuclear explosives or for other military purposes and (b) the misuse of safeguarded facilities with the aim of producing unsafeguarded nuclear material.
>
> In view of the voluntary nature of this acceptance of safeguards, and for other reasons, it is reasonable to expect that the normal results of applying safeguards will be to confirm that there has in fact not been any diversion. Confirmation that this is so results from independent verification by the IAEA inspectorate. The assurance thus obtained from the IAEA's activities as an independent and objective auditor increases confidence between States and helps to diminish political insecurity which is normally the main motivation for acquiring nuclear weapons."

It would appear that Fischer's view of the nature of assurance differs significantly from that of the International Atomic Energy Agency.

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Washington, D.C. 20555

Ethics and nuclear weapons: a play

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SHIRLEY HAZZARD

A writer reflects

The first news of the atomic bomb reached Australia on a winter morning—I suppose it was the day following the event. I was dressing to go to school, and heard the announcement on the radio. I hardly know why the moment was immediately understood to be important—anesthetised as we were by six years of information on mass bombings throughout Europe and in Asia. Even then, in the brute climate of war, there were persons who began to ponder the consequences—material, ethical, psychological; self-evident, or subtle. I was not close to such people; but the debate opened quite quickly and was already a global preoccupation by the time the tests took place at Bikini atoll.

Twenty months after the bomb was dropped, I was at Hiroshima. I was en route to Hong Kong, where my father was taking up a government job. We had traveled from Sydney to Japan in a tiny ship, taking over a month on the way and stopping only once, briefly, for water in New Guinea. The ship was carrying about 50 wives of Australian officers in the occupation force in Japan. Some of these women had been parted from their husbands for the duration of the war. We arrived at the port of Kure, which was a shambles from bombardment, and spent the next day at Hiroshima, a short drive distant. The city center was still a wasteland, quite empty apart from the mangled dome and blitzed shreds even then familiar to us from photographs. On the outskirts, a lot of rebuilding was taking place: new houses swiftly assembled from light timber and plywood. Men and women were engaged in this busy scene, while the vast central area of the bombing remained still and empty, like a gray lake. The attitude of my family and of the officers accompanying us was the conventional one: that the bomb was an inevitable and justified—and even merciful—outcome of total war. Yet among these generally unreflective people there was some uneasiness in discussing it. No one could explain why the bomb had not, in a first instance at least, been dropped in an unpopulated place. That was the extent of objection.

A recurrent theme at the time was that such a weapon would come to be "like gas" in the First World War—impossible to employ from fear of retaliation in kind. No one I knew had yet envisaged the immensely more destructive hydrogen bomb, or the stockpiling of thousands of such devices. In other words, we had not then recognized that self-destructive tendencies in world leadership—and, by extension, in mankind—would prove stronger than rational fear or instincts of self-preservation.

I was, by my generation, part of the new world. But I had been raised in the climate of war, not only from having passed my late childhood and early adolescence in years of world war, but from being born—as were all my contemporaries, British or Australian—into consciousness of "the Great War." The lingering pity and horror of the 1914 to 1918 war pervaded and in some measure dominated our young lives, along with the visible misery of the Depression. My father had been in the trenches in France at the age of 17. In a way, this led to our early acceptance of battle as, in Mussolini's terrible words, "the natural condition of man," and I had never heard either of the great wars discussed in anything other than a context of patriotism and righteousness. However, I think now that the immense presence of the First World War in the thought and life of the decades between the wars was indicative of doubts already raised in the unconscious mind. I never heard that war discussed in a casual way by its veterans (as I have, for example, heard later veterans relate incidents of the war of 1939 to 1945). The scale of horror had been too new, too vast. The next change of dimension came, I think, with the atomic bomb. The intervening horrors, of the Second World War, had to some extent been anticipated by human imagination. But not the bomb.

The world conditions in which the atomic bomb was dropped can hardly be recreated in the mind. In Australia, we had recently and narrowly escaped Japanese invasion. Japanese bombs had fallen on Australian soil. Japanese submarines had entered—and briefly bombarded—the harbor of Sydney. Like thousands of other schoolchildren, I had been an evacuee. Thousands of Australians had spent years in Japanese prison camps, and many had died there in atrocious conditions. Nearly every able-bodied man in the land had gone to war, and the casualty lists were long. The animus of revenge in war is powerful, and it is merged with the—more rational—deliverance.

Some weeks ago an Australian friend—a poet and entirely gentle person—visited us in New York. We spoke in despair of the neutron bomb, with which Reagan had just announced his intention to proceed. The poet mentioned his own "first memory" of the atomic bomb. He had been a soldier at the time and dying of wounds in a makeshift jungle hospital on a remote Pacific island. His unit had learned it was hopelessly outnumbered by Japanese troops a few miles away. With the news of the bomb, they were saved. He said, "I never knew how to handle this in my mind. I wish the bomb had never been invented, let alone dropped. But if it had not been, I would be a rotting skeleton these thirty-odd years."

The fallout of the bomb on our modern thought and life has been continuous and incalculable. And combined, over the same period, with other destructive phenomena that exist on a new, incomparable scale: pollution of air, water, oceans, upper atmosphere; the death of forests, of species; the depletion of natural resources and essential minerals; overpopulation and threat of world famine; dislocation of entire peoples; and the apparent disintegration of structures of civilized order. It is impossible to be confident of "posterity." Even were we assured of the survival of the race, we could not prefigure to ourselves the forms of future human existence or its qualities of mind. In our present uncertainty, not the least of the dangers lies, too, in self-dramatization: our state of suspense is exploited, on the one hand, to excuse inertia; and, on the other, to justify violence.

I have written, briefly, in fiction, on Hiroshima and the bomb. In my own life, the event was a confused beginning of pacifism. And also of an awareness that immense evils are impossible to hold in the mind. One's own contemplation of them can carry dangers of posturing, of easy vehemence, and of claims of unearned morality. By contrast, acts of goodness—even of "public" goodness—can only be properly discussed or understood in their individual manifestations. The dominant proposition of the atomic age—that humankind is doomed by its own evil—cannot be refuted with any single sweeping show of virtue analogous to the bomb. To counter the implications of the bomb, humanity can only offer its history of individual gestures—the proofs of decency, pity, integrity, and independent courage. I suppose this touches the central premise of the Christian ideal, and the very meaning of the word Redeemer. However, the sense of it as a reality was formed in me long before I realized that, and was developed by a few great living spirits I have been lucky enough to know.

I cannot prevent the making of the bomb—although, like others, I may make my protest. I cannot prevent the use of it. My faith is, merely, that the world against which the bomb may be used has not entirely deserved it. ☐

Shirley Hazzard, a writer, is the author of Defeat of an Ideal: A Study of the Self Destruction of the United Nations *(1973). Her most recent novel is* The Transit of Venus. *Reprinted from The New Boston Review, November — December, 1981 ©.*

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Erratum

On page 27 of "Science in the Brezhnev Era" by Loren R. Graham in the February *Bulletin*, the sentence giving statistics should read as follows: "According to published Soviet statistics, between 1971 and 1974 infant mortality rates rose by over 20 percent; between 1960 and 1974, death rates for people in their fifties rose by almost 20 percent, and death rates for people in their forties rose by more than 30 percent."

Author query

Historian working on early history of carbon 14 dating requests copies (or knowledge of existence thereof) of correspondence with W.F. Libby during 1930 to 1945. Please contact Greg Marlowe, 917 Ponoma Avenue, Albany, California 94706.

MX smokescreen

Christopher Paine (*Bulletin*, Dec. 1981) does a skillful job of exposing the apparently confused and shallow thinking underlying President Reagan's announcement of the MX system's basing mode. By pointing to the obvious anomalies of silo-basing the MX and chronicling the predictable flap that has arisen in Washington, he creates the image of near buffoonery in the Pentagon and the White House. Because appearance and reality are often not the same in the political world, however, Paine may have missed the point of the exercise.

What Reagan's announcement accomplished was to focus public attention on the silo-basing issue, using Secretary of Defense Caspar Weinberger (whom many expect to be axed soon anyway) as his foil. If one begins from the premise that the President does not and never has had any intention of putting the MX in unprotected Minuteman or Titan silos, however, the announcement emerges as a very clever bit of political sleight of hand designed to get Reagan what he *really* wants: MX missiles *and* an anti-ballistic missile (ABM) system to protect them.

Then the Titan-basing option is nothing more than a smokescreen, and it has already partially worked; Congress has authorized construction of the missile system itself. Fully operational MX missiles will begin coming off the production line in 1986, and once they are there, they will have to be put somewhere. That being the case, focusing on what the President himself said was an interim solution unnecessarily diverts attention from what really matters, the options for a permanent basing mode.

When one examines the options the Administration itself finds promising, it seems that the ABM option is bound to win out. Given that the first missiles will enter the inventory on the eve of the 1987 renewal of the ABM Treaty, one cannot avoid a rejoining of the ABM debate of the 1960s.

The Administration announced it would pursue three permanent basing options. The three options, of course, are air-launching (the "Big Bird" system that Weinberger appears to favor), some form of deep silo basing (specially built silos, caves), or silo-basing missiles but protecting them with ABMs. The first two options have considerable expert opposition and virtually no constituencies, and once the weakness of these possibilities is revealed, ABM emerges as the only remaining contender.

Objections to air-launching and deep-siloing are obvious and strong.

Air-launching has been considered and rejected by several Administrations (including President Carter's), and there are at least three good reasons to expect the same result again.

- The matter of cost. An air-launched system (largely because of maintenance requirements) was the one MX-basing option considered by the Carter Administration that was actually more expensive than the enormously costly multiple protective shelters system, and there is scant reason to believe the "Big Bird" would be particularly cheaper.
- The question of missile accuracy. Although the NAVSTAR satellite system will materially improve the accuracy of all strategic weapon systems, mobile launching platforms are inherently less accurate than fixed-site launching, and launching from the sky is clearly the most mobile platform of them all.
- The opposition of the Air Force, which would operate it. It is extraordinary indeed for the U.S. Air Force to recommend against procuring a new airplane (and especially one whose mission is strategic bombardment), but that was the conclusion of a two-year in-house study by the Air Staff.

Deep-silo basing raises similar concerns.

- Given the extravagant cost figures that have been attached to "superhardening" Titan silos to 5,000 p.s.i., the mind fairly boggles at the initial construction costs of silos which would be deep enough so that even the depth of the crater after a direct hit would leave the missile with a sufficient layer of dirt to provide protection. Variants of deep siloing utilizing natural (caves) or man-made (abandoned mine shafts) storage facilities undoubtedly entail massive conversion costs as well.
- The rather obvious way to disable such sites would be to bury the missile egress points with so much debris as to entomb the contents. Advocates always include some burrowing capability in their deep silo proposals, but the practical ability to dig through tons of debris in anything like a timely fashion for retaliatory purposes will always remain problematical.

Insulating missiles from all the effects of a nuclear detonation above them presents special design problems. Despite the havoc they can wreak, ballistic missiles are extremely complex, delicate machines. Problems such as adequate suspension to protect from the percussive effects of blast overpressure or the electronic dislocation of electromagnetic pulse present vexing practical difficulties that have bedeviled deep silo advocates in the past and remain significant barriers.

If these kinds of difficulties combine with the almost total lack of political or expert constituency for either scheme to lead predictably to the early demise of air-launching and deep-siloing, then ABM emerges from the President's agenda as the victor by default. Many objections can obviously be raised about the ABM "solution" (for example, cost, system effectiveness), but there is one critical difference often overlooked by critics. Unlike the other options on the President's agenda, ABM *does* have a sizable constituency. Composed of ABM advocates from the 1960s, elements within the professional military and conservative "defense intellectuals," they form a not unimpressive coalition. Moreover, they are a group in fundamental ideological harmony with President Reagan; if he needs to be convinced about ABM's virtues, there will be no dearth of positive advice from those around him. Since the launcher and interceptor levels that form the core of the ABM Treaty are incompatible with active defense in a MIRVed world, the logic of the option demands emasculating amendment or abrogation.

To return to Paine's argument, one must ask if the latest developments truly represent "running in circles with the MX," as his title suggests. At one level, as he admirably documents, the answer is yes, in terms of the interim basing solution. If, however, the exercise has been one in legerdemain to divert attention from longer term plans and the arguments presented above have any cogency, then the circle may be in the process of being broken.

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* * *

Paine's response: Reagan's MX decision may indeed have the Machiavellian underpinnings Donald M. Snow ascribes to it, and then again, it may not. The sincerity with which *any* Administration advances its defense programs is always a matter for speculation. The relevant question, however, is whether the Reagan Administration significantly *advanced* the cause of ABM silo defense by cancelling the deceptive basing scheme, the only basing option for which an active defense is analytically plausible. In fact, under pressure from the Senate Armed Services Committee, Secretary Weinberger has written a letter promising to reconsider deceptive basing.

I also doubt that the Administration's enthusiasm for a possible silo defense in the 1989-1990 period, after the expiration of a hypothetical *second* term, would exert a controlling influence over a decision made in 1981 in fulfillment of election year promises. Certainly, the decision by itself did nothing materially to advance the prospects of the Army's current low altitude defense system proposal from where they were at the end of the Carter Administration. However, if Snow simply means that in general, Reagan Administration officials look more kindly on ABM defenses and less kindly on the treaty designed to inhibit them then certainly, his point is well taken. But one cannot rescue the general incoherence of Reagan's strategic policies with the imputation of a secret ABM agenda. The official confusion and indecision reflected in my article is, I fear, genuine—a product not only of the fruitless quest for the Holy Grail of "Invulnerability," but also of the impending collision between the Administration's strategic fantasies and economic realities. The fact remains, if the MX is deployed by 1986 as promised it will be deployed in unprotected silos.

Finally it is not clear what Snow means by the phrase, "Congress has authorized construction of the missile system itself." Congress in fact has approved only engineering development of the missile, including funding for six test missiles. It has *withheld* basing system construction monies already authorized, and both Congress and the Department of Defense have yet to decide on whether the MX is ready to move into quantity production. That decision is scheduled to be taken in July 1983. The flash in the pan Titan basing option played no role in persuading Congress to authorize funds for "construction" of the MX. There is still ample time to abort this folly.

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Doomsday Clock

To many people in the scientific community, as well as to journalists and other interested observers, the time shown on the doomsday clock of the *Bulletin* is an important indicator of the level of global tension and the danger of war. As with other such measures, questions arise as to changes in emotional and intellectual processes that may accompany the perception of impending or receding crises. Historical documents and data from experimental simulations have generally shown that increasing levels of tension induce greater stress in decisionmakers and lead to decreases in information processing complexity.[1]

Most definitions of information processing complexity include variables such as information search and usage, the generation of alternatives, flexibility in response to new information, and the ability to consider how any particular action may be viewed by other participants in the interaction (including one's opponents). One approach uses a 1 to 7 scale along which trained judges score random samples of pertinent material. Lower scores indicate low levels of integrative complexity: the

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Funds for this research were provided by the Canada Council and the Social Sciences and Humanities Research Council of Canada.

consideration of only one side of an argument, categorical and dogmatic thinking, restricted search for information, and rigid decisions. High integrative complexity is defined by flexible, information-oriented, finely tuned, and combinatorial decisionmaking.[2]

The study reported here was concerned with whether similar changes in integrative complexity would occur in material that was generated by concerned and knowledgeable observers, but not actual decisionmakers, involved in international tension situations. Specifically, the interest was in seeing whether the time shown on the doomsday clock of *The Bulletin of the Atomic Scientists*, as one measure of the danger of war, was systematically related to integrative complexity expressed in editorials appearing in the same journal.

Editorials appearing in the *Bulletin* between 1947 and 1974 were divided into three categories: high tension, identifying editorials published when the clock showed less than 5 minutes to 12; medium tension, with the clock showing between 5 and 10 minutes to 12; and low tension, with the hands at 10 or more minutes before 12. A total of 222 paragraphs was scored.

The results showed a relationship between the nearness to midnight of the hands of the doomsday clock and information processing complexity in the editorials. The average complexity scores were 3.05 for paragraphs taken from editorials during periods of low tension, 2.87 for medium tension, and 1.62 for high tension. Analysis of variance showed this to be a highly significant intergroup difference, with a probability of chance occurrence of less than 3×10^{-6}.

Obviously, the integrative level of editorials is influenced by the perceived likelihood of nuclear war. It is particularly interesting to have obtained this effect in passages written by eminent scientists who are deeply concerned with international relations, but who are not themselves governmental decisionmakers in diplomatic and defense affairs. It should be noted that the editorials did not necessarily deal with the particular situation that was the determining factor in setting the doomsday clock. In fact, such editorials were the exception rather than the rule. Thus, the relationship between the two measures appears to show the pervasive effect of heightened tension, at least on individuals as knowledgeable and concerned as those who are involved in the editorial policies of *The Bulletin*.

[1] Peter Suedfeld, "Stressful Levels of Environmental Stimulation," in *Stress and Anxiety* edited by Irwin G. Sarason and Charles C. Spielberger (New York: Halsted, 1979), vol. 6, pp. 109–27.

[2] Suedfeld, "*Die Messung integrativer Komplexität in Archivmaterialien*," in *Kognitive Komplexität*, edited by Heinz Mandl and Günther L. Huber, (Göttingen: Hogrefe Verlag, 1978), pp. 179–92.

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About the latest report that a doomsday clock is set at four minutes to midnight... is that Eastern standard time or what?

Human rights linkage

I object to the *Bulletin*'s recent "linkage" of Soviet positions on arms control negotiations with Soviet behavior in the human rights sphere (November 1981). I have in mind the inclusion of a cartoon of a Soviet prison camp in the middle of Herbert York's article on "Sakharov and the Nuclear Test Ban," and the fact that this article was immediately followed by an article on repression of Soviet human rights activists.

In fact, despite the reprehensible nature of Soviet human rights violations, these have little to do with Soviet arms control positions or Soviet compliance with arms control treaties, despite Elizabeth Young's contentions (also in the November *Bulletin*). The

Soviet Union has complied with all major arms control agreements with the United States, including SALT II, despite the fact that the treaty has not been ratified.

Regarding Soviet positions on arms control issues, I would like to comment on the subject of York's article, the test ban. Two weeks after Eisenhower's renunciation of the test-ban moratorium, Soviet Premier Khrushchev vowed to continue the moratorium as long as no Western powers "begin testing of atomic or hydrogen weapons" (*Pravda*, Jan. 15, 1960). York mentions this. What he does not mention is that one Western power—France—did begin testing nuclear weapons in February 1960 and continued to do so. But this could only have served as a pretext for resumption of Soviet testing.

The most likely reason is that the Soviets felt genuinely threatened by the decisions of the Kennedy Administration in the spring of 1961 to accelerate the Minuteman and Polaris missile programs initiated under Eisenhower, despite the fact that there was no longer any evidence to support claims of a Soviet "missile gap." Seen in this light, Khrushchev's rejection of Andrei Sakharov's plea in the summer of 1961 to continue the test ban seems well-considered and not insincere.

In 1960, a comprehensive test ban was clearly in the Soviet interest, and Khrushchev recognized this. Such was no longer the case in 1961, when Soviet missile programs had fallen far short of expectations while U.S. ones surged ahead. This fact, coupled with U.S. insistence on on-site inspection, was most responsible for the failure to obtain a comprehensive test ban.

It is a common tendency among those of us in the West who oppose the nuclear arms race to want always to apportion blame equally on both superpowers—regardless of the particular issues involved. If domestic policies of the two countries are then brought into consideration, there is little chance of understanding clearly what is happening. The situation today is not dissimilar to that of 20 years ago. The present U.S. arms control policy, if it can be called that, seems to be to force the Soviets to make concessions by presenting them with our determined drive to achieve "nuclear superiority." This did not work in the early 1960s. The Soviets began negotiating serious arms control agreements on strategic forces only when they were confident that a certain "parity" had been achieved in these forces. This is why Khrushchev rudely rejected Sakharov's notion of stop-

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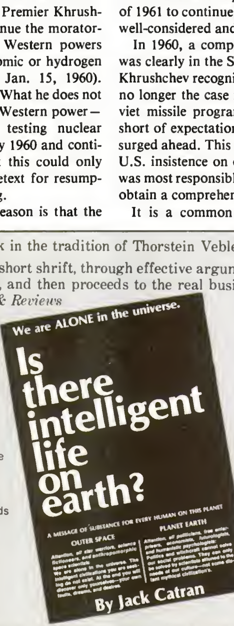
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ping the arms race when the Soviet Union was behind.

If the Soviets soon begin deploying a new generation of dangerous counterforce weapons, it will have little to do with the fact that they have unconscionably banished Andrei Sakharov to Gorki. It will be because the United States is now intensely expanding its counterforce arsenal instead of negotiating a freeze on the arms race before these "nuclear warfighting" weapons make nuclear war a reality.

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On 'Inertial Confinement'

Friedwardt Winterberg, in his December *Bulletin* letter concludes a valid and thoughtful discussion of fusion research and the U.S. government's "born secret" policy with the statement that "The Third World wants nuclear energy for its people and views all attempts by our government to sell them the uneconomical solar energy option as a new form of colonialism. Fusion is also the great hope for them."

The contention that our government has ever tried to sell anyone the solar energy option is grossly misleading. Rather, the U.S. government and the Department of Energy have been trying for 30 years to sell the *proven uneconomical* nuclear option to any and all Third World bidders. These sales have not been promoted or secured for the benefit of those societies which in most cases lack the electrical grid system to distribute power beyond major industrial centers, but instead for the corporate profit and prestige needed to keep our own ailing nuclear industry afloat.

With respect to new forms of colonialism, these would not result from the use of solar options which offer true energy independence. It is our nuclear proliferation policies which have created the new form of colonialism by tying massive *public-sector* debt financing for *private* profit to colonial dependence on the international uranium cartel for fuel and "security" at exorbitant prices.

The same nuclear policies threaten global security. They are responsible for the proliferation of nuclear weapons-capable states and a substantial drain of investment, technology and human resources from the global economy (over $40 billion in federal research and development funding since World War II).

Fusion, like fission, is not the "great hope for them" or for us. It is, like Maya, the grand illusion.

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Working for human rights

In the August/September issue of the *Bulletin*, I described two Amnesty International Group 18 cases. Amnesty International has since closed the case of Florin Preda, the Romanian telecommunications worker imprisoned for attempting to emigrate without official permission. Though no official confirmation has been received, Amnesty International believes that Preda has been released.

Unfortunately, the human rights situation in Guatemala remains grim. A report entitled *Guatemala: A Government Program of Political Murder* was released by Amnesty International in 1981. This report documents that many of the murders and "disappearances" that have occurred in that country are carried out by squads under the direct control of an agency housed in an annex to the National Palace in Guatemala City.

Between July 1978, when General Lucas García became president, and January 1982 we estimate that 5,000 Guatemalans have been seized and killed. (Amnesty Report of Jan. 8, 1982). Amnesty International continues to be gravely concerned about these attacks on the real or imagined non-violent opposition to the Guatemalan government.

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U.S./USSR Consultative Commission

In the article by Duncan L. Clarke (*Bulletin*, Nov. 1981), a suggestion—not an explicit claim—is advanced to the effect that the US/USSR Standing Consultative Commission has addressed questions concerning compliance with the Biological Weapons Convention and the Threshold Test Ban Treaty. It has not; and, while the sponsoring governments could charge the Commission with such responsibilities, they have not done so.

The implementation responsibilities of the Standing Consultative Commission, as of this date, are those associated with the following agreements:

- Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Anti-Ballistic Missile Systems.
- Interim Agreement Between the United States of America and the Union of Soviet Socialist Republics on Certain Measures With Respect to the limitation of Strategic Offensive Arms.
- Agreement on Measures to Reduce the Risk of Outbreak of Nuclear War Between the United States of America and the Union of Soviet Socialist Republics.
- Treaty Between the United States of America and the Union of Soviet Socialist Republics on the Limitation of Strategic Offensive Arms.

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